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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, residential

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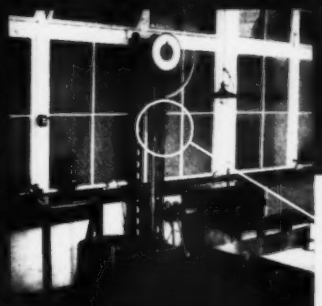
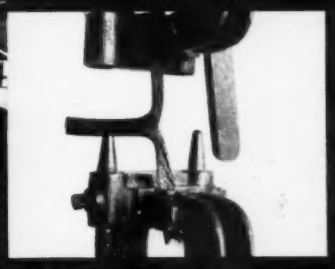
Wire is only as good as its Insulation

HOLDING IN LEASH the giant hulk of a ship, the hawser's strength is measured by its elasticity or tear-resistance.

RESISTANCE TO TEAR is a tremendously important feature of U. S. Tempered Rubber insulation for electrical conductors. Through the development of tear-resistant compounds of tough Tempered Rubber, U. S. Scientists have set new records in deferring the breaking point of wire and cable insulation...increasing the useful span of the conductor by prolonging the unimpaired life of its insulation. That is why there is an *extra* margin of profit to the buyer or the seller of U. S. Rubber insulated wires and cables.



THIS IS THE SCOTT TESTING MACHINE



THIS SCOTT TESTING MACHINE of the pendulum type demonstrates the tensile strength of U. S. Rubber insulation. It is one of many laboratory and field tests made by U. S. Rubber scientists to prove and improve the strength, efficiency, and durability of U. S. Rubber insulation. Actual results of these tests are available upon written request.

United States Rubber Company

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THE PAST RECORD OF BULL DOG NEW DEVELOPMENTS AND IMPROVEMENTS IN ELECTRICAL DISTRIBUTING DEVICES IS A GUARANTEE THAT THE FUTURE HOLDS EVEN GREATER EXPECTATIONS. WATCH OUR NEW DEVELOPMENTS . . . THEY WILL HELP YOU GET MANY JOBS AT MORE PROFIT.

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DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA LTD.
TORONTO, ONTARIO

ELECTRICAL CONTRACTING
JUNE 1937

It Paid the Monkey

BECAUSE SOME MONKEY ANCESTOR of ours started picking up things, men now rule the earth—not super-ants or super-cats. If you want that story, read Clarance Day's delightful little book "This Simian World." The point is that monkeys developed the opposable thumb and men learned to use tools. Having tools, they conquered.

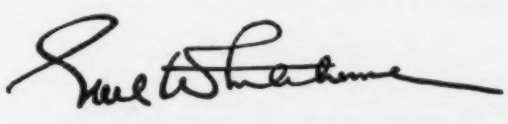
IT WAS AN IDEA. And the idea worked. It still works. And the man who employs tools intelligently is better than the man who doesn't. He gets his job done more quickly, more efficiently, more effectively. He can do more jobs. He can give better service. He can hold more customers, make more money.

CARLYLE WROTE IT DOWN for us—a long while ago. He said—"Man is a tool-using animal. Without tools he is nothing. With tools he is all." He was right, and this is just as true in electrical construction as anywhere else.

LABOR IS VALUABLE TODAY and commands a high price. It should not be wasted. The smart employer, therefore, uses his head and supports his labor with every modern cost cutting tool that will help make the work easier and more interesting and speed the job. And, the men take pride in good tools, do better work. Out of it come lower estimates, more business, increased employment, better earnings.

THE GREATEST ENEMY OF PROFIT is habit—just doing things in the old way. Times change, costs go up, old methods are no longer economical. Change them too! It is as necessary in electrical contracting, repair or maintenance as in making automobiles.

ABOUT ONCE A YEAR, then, study the new tools available. Figure out what time saving equipment can be amortized in each big contract. Keep up with tool progress. It paid our ancestors. It still pays.



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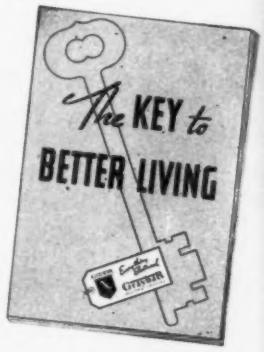
Reprinted Courtesy of College Humor

"It's like this every morning. Why don't you cook breakfast in the kitchen?"

Is there an electrical contractor in the audience?

The not-so-happy home pictured above looks like a good prospect for a complete re-wiring job. No doubt about it. ¶ The question is, however—how is the Electrical Contractor going to reach homes like this effectively. How is he going to sell modern wiring to prospects whose understanding of practical electricity may be very limited? *What* should he sell? ¶ In way of an answer . . . to help progressive Electrical Contractors sell electrical *convenience* . . . Graybar has prepared a comprehensive 16 page booklet—"The Key to Better Living." You'll want to see it . . . your prospective customers will want to see it. It tells everything! Furthermore, we have a plan for distributing imprinted copies . . . Mail this coupon—today!



***This booklet** explains everything your customers will need to know about wiring. Complete! Interesting! Sells! Send for it!*

Graybar

OFFICES IN 82 PRINCIPAL CITIES

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Gentlemen: Please send us full information about your booklet, "The Key to Better Living."

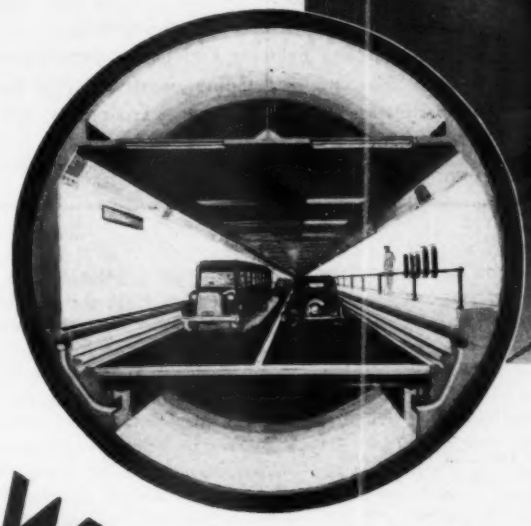
NAME .....

ADDRESS .....

CITY ..... STATE .....

ALMOST FINISHED—*A nearly-completed section of the 8075-ft. Lincoln Tunnel, with glass tile ceiling in place.*

AIR CONDITIONING—*Fresh air is forced in below the two-lane roadway, while overhead duct spaces carry off the gas fumes. (an artist's drawing)*



Wiring Under the Hudson

Manhattan's Lincoln Tunnel to New Jersey Is Just About Completed Let's Tour the Electrical Job.

AS Queen Mary passengers gaze at New York's skyline, while the big ship edges up to her dock in the Hudson, they do not realize that crews of electrical workers are busy directly below them in the river bed. But there down under the water, another great engineering feat is in its finishing stage—the Lincoln Vehicular Tunnel at 38th Street. Early next year it will be opened for traffic between New Jersey and Manhattan, and automobiles will begin to speed across, more than forty feet below the river's bottom.

Involved in this large construction job of world-wide interest, there is an unusually complicated electrical installation. The electrical contracts for wiring the present south tube, measuring some 8000 ft. long, are likely to total $1,500,000. Built by the Port of New York Authority, the project originally was financed by a loan of $37,500,000 for the construction of the south tube. Later, the PWA made an outright grant of $4,700,000 and in November 1936, Port Authority bonds were sold for the construction of the north tube.

The south tube will be used for two-lane, two-way traffic until the north tube is completed. When the second tube is in service, the handling of traffic will be reorganized to provide for two-lane, one-way traffic in each tube.

The present stage of construction is ideal for presenting pictorially what constitutes the daily work of J. Livingston & Company, the electrical contractors who are equipping the tunnel electrically. Few large jobs embrace such a wide diversity of construction methods, for many systems of wiring are involved, embracing general lighting, high tension power supply, traffic control, fire alarms, code calls, telephones, ventilation and other specialized services.

Here are raceway systems of tile, asbestos and rigid iron conduit, special raceways and bus compartments, conductor assemblies ranging from low voltage up to 15,000 volts insulation, multi-conductor cable combinations for motor and traffic controls, large telephone and signalling cables, extremely rigid cable splicing and terminal box requirements and other equally exacting tasks. And at every step, this job is

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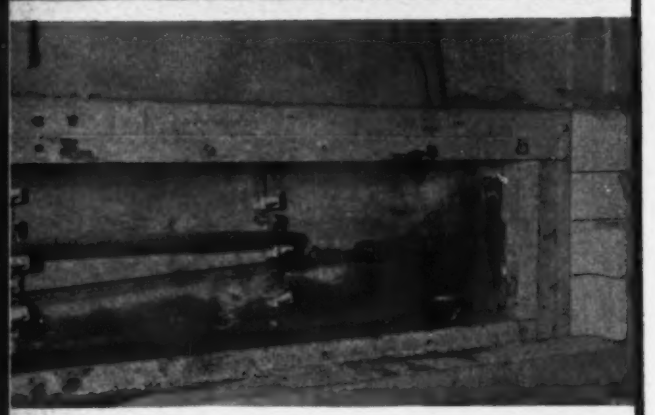
SYSTEMS OF WIRING

General Lighting in Tunnel, Portal Plazas and Buildings.
High Tension Power Supply, Transformer Stations, and Distribution Systems.
Traffic Controls.
Fire Alarms.
Code Calls (Four Systems).
Telephones (one main switchboard type independent system, and three inter-floor systems).
Carbon Monoxide Analyzers and Recorders.
Supervisory Control of Motors, Oil Circuit Breakers, Transformers, Plaza and Tunnel Lighting.
Signal Lights and Bells for Various Equipment Functions.
Vacuum Cleaners; Air Compressors; Storage Batteries, Chargers and Rectifiers; Testing Equipment, and Other Miscellaneous Equipment.

1

READY TO GO—*A 520-ft., 3-ton, 3-conductor, 350,000 c.m. lead and varnish power cable hitched and "doped" ready to pull. The reel revolves on a 2¼-in. steel shaft in 6-ft. wheels.*



2

HOME STRETCH—*This 520 ft. run of 15,000-volt cable was pulled with a tractor-powered winch and ⅝-in. messenger cable in 25 minutes. Note the extra tackle attachment eye.*

3

POWER METHODS—*A special 4-cylinder tractor, with direct-driven cable winch, made the rounds of all tunnel pulling jobs.*

4

BUILDING UP—*A 15,000-volt, 350,000 c.m. cable, being spliced at a flush chamber in the sidewalk. Note end of a cable (left) with pull-ring not yet removed.*

5

AFTER SPLICING—*Wiped joints and exposed sheath covered with asbestos tape. One gallon of petrolatum was required to fill these splices. Note the filler caps.*

abnormal and interesting because of the distances involved, the remoteness from surface work centers, the segregation of different craft operations in a crowded passageway and the complicated combination of electrical features.

The most important requisite of the job was that the operations of the electrical installation be trouble-free, in the interest of safety to the tremendous flow of under river traffic. Cars will travel through this under river artery at high speed with lights out, and for the tunnel illumination to fail would be disastrous. So, first in the minds of the engineers was the choice of equipment such as feeders, transformers, control panels and relays, to provide a fool-proof tunnel lighting system. Ventilation is equally vital, for a continuous stream of motors will be exhausting into the tunnel, hour after hour.

So, remote control and supervision of fan and pump motors, the recording of carbon monoxide gases, the switching of incoming high tension energy sources, and other features have received the same careful attention. And to make all this apparatus work for years to come in coordinated fashion, despite ravages and hazards of dampness, gases and dusts, specially designed devices and equipments and carefully specified materials of high quality are being installed throughout.

Master supervision and control of motors, signals, lighting and other systems is provided for in a separate building on the New Jersey side of the Hudson. Power is supplied from the primary networks of two states, at 4160 volts in New Jersey and at 13,200 volts in Man-

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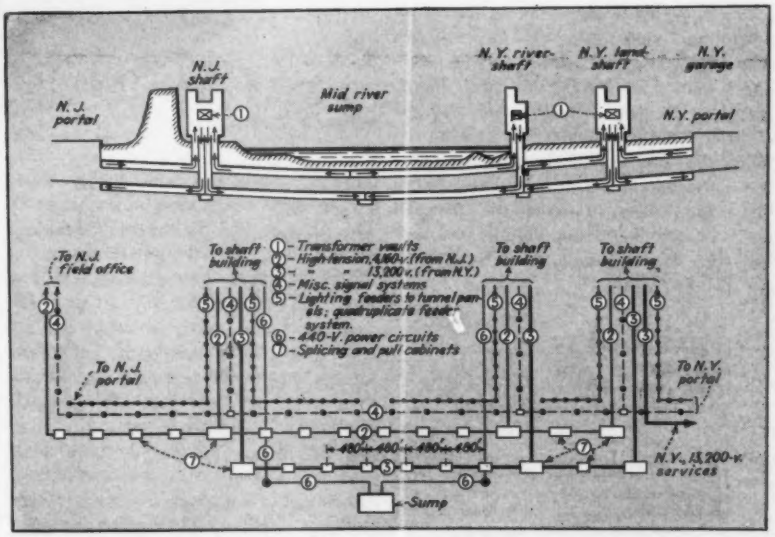
SOME LOADS AND QUANTITIES (SOUTH TUBE ONLY)

Approximate Connected Load		5,000 KVA.
37 transformers (including those installed for emergency and duplicate operation)	approx.	12,650 KVA.
55 Motors for pumps, fans, etc		4,258 h.p.
15,000-volt, 3-cond. cable	approx.	30,000 ft.
600-volt, one to 4-cond. cable from No. 8 to 1,000,000 c.m.	approx.	32,000 ft.
300-volt cable, 27 No. 16 wires		3,000 ft.
300-volt cable, 80 No. 16 wires		3,000 ft.
300-volt cable, 114 to 331 No. 16 wires		20,800 ft.
300-volt cable, 5 to 75 pairs No. 18 wires		12,100 ft.
600-volt cable, 3 to 37 No. 14 to No. 6 wires		43,000 ft.
4/0 to 500,000 c.m. bare copper ground wire		3,000 ft.
Various relays	approx.	1,400

hattan. To utilize these sources of energy there is an extensive system of interconnecting cables between the tunnel and various structures on both sides of the river.

While every modern method of damp proofing and seepage protection is embodied in the tunnel's design, the electrical system in itself must none the less make provision for extreme conditions of moisture and corrosion. Therefore, galvanized conduit, as specified for use in the tunnel, was required to have eight applications of zinc under the hot-dip process, and all couplings, elbows, nipples, boxes, bushings and other accessories the same. All threaded ends of conduit had to be painted with approved red lead, and all cuts were made with a hack saw rather than a pipe cutter. Running threads were not permitted. Factory elbows were only allowed at points indicated on plans, and at all other locations the sweeps, bends and offsets were generally limited to a radius of not less than ten diameters of the conduit. Not more than two quarter bends, or the equivalent thereof, were allowed between any two outlet boxes, except as otherwise approved.

For the same reasons, all wires and cables in the tunnel proper, and in the lower levels of the fan houses, employ lead sheaths. Also to safeguard against



6

7

8

6

QUICK TRANSPORTATION—*Cable and other materials were hauled in the tunnel by tractors. Here is a reel of 19-conductor No. 6 control cable off to a pulling location.*

7

GETTING THROUGH—*Fish snakes—¾-in. by ⅛-in.—had roller skates every 50 ft. to get No. 12 solid iron pull wires through 500 ft. runs.*

8

TAP-OFF—*Here a platform splicer is making a 5-pair tap to a 75-pair, No. 18 telephone cable. Workmen use splicing kits containing everything needed.*

SHORE TO SHORE—*Four basic wiring systems connect the portals and buildings on the Manhattan and the New Jersey shores.*

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IDE-WALL RACEWAYS — *Long multiple runs of asbestos conduit for signal wiring, and rectangular clay tile for high tension cables.*

COLOR CODES—*This roadside junction box will join two 500-ft. 19-conductor, No. 6, color coded and lead cables. Note porcelain-tipped cable racks.*

ROLLING TOWERS—*For equipment near the ceiling, these rolling steel towers moved along to the job, beginning with temporary lighting.*

PIPES GALORE — *The conduit crews had their problems in the heavily motored fan house. Here hand benders were putting kicks in 1¼" and 2" conduit.*

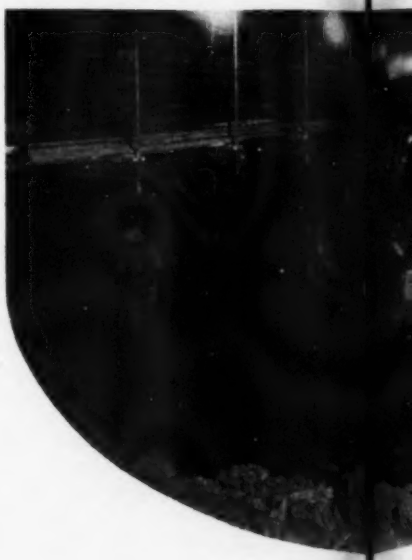
fire hazards at splicing chambers a heavy fire resistive covering was applied. Equipment units such as pumps or fans were in many instances duplicated or installed in triplicate, just to make sure that mechanical breakdowns could not impair such important functions as fume or seepage removal.

Runs of installed conduit were required to be tested for freedom from burrs and obstructions, by pulling through each conduit run 20-foot lengths of three rubber-covered wires, in the following sizes—

For ¾-in. conduit—three No. 8 SBRC
For 1-in. conduit—three No. 6 DBRC
For 1½-in. conduit—three No. 0 DBRC
For 2-in. conduit—three No. 4/0 DBRC
For 2½-in. conduit—three 250,000 c.m.

All runs of conduit except for branch lighting circuits are identified with brass tags tied on with brass wire. These tags bear the identification number given on drawings.

Since so much cable was used, and because of the extreme length between opposite ends of the tunnel, the problem of efficient cable preparation, pulling and splicing was important. The use of pulling rings for all large lead sheathed cables was standard practice. These were made up by the cable manufacturer for each run. Once a reel of cable was set up in readiness for pulling, it was only necessary to hook on the messenger cable clevis link. These pull rings assured the proper mechanical strength for pulling, because they were made up first to the bare conductors, before they were finally wiped to the outer lead sheath of the cable. This then served the further advantage of providing an effective end-seal for the cable, while there was also no reason for cable waste.



GUARDED HANDIWORK—*Expensive cable work in cabinets was protected with temporary hinged wood covers until bronze covers are installed.*

HEAVY BENDING—*For the larger conduit sizes the pipe crews used specially-built 25-ton jack benders, driven by a threading mule.*

Special kits were ordered for the many types of cable splices. These contained in one labelled package all the items of insulating material—connectors, sleeves, solder—required for a specific splice or tap. As a result, there was no occasion for confusion, delay or waste in the use of materials by splicing crews. The value of this

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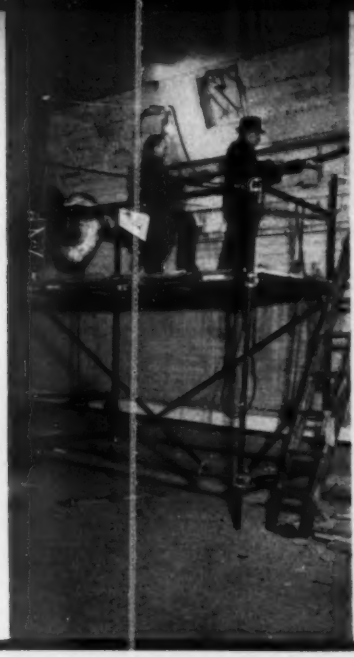


...NECTION DIAGRAMS—*Small ... drawings showing details ... pasted at each chamber, ... of the splicers, to avoid ... use of large blue prints.*

CABLE SPLICING—*For high-up jobs there were work platforms like this, made of standard pipe, switchboard fittings and planking.*

LASTING CONSTRUCTION — *Cast iron junction boxes, set in concrete wall, for four 4-in. primary cable riser conduits, leading to transformers in a vent shaft.*

FIRE PROOFED—*A group of 15,000 volt cables with a final covering of Asbestoment fireproofing over their layers of Niagrite tape.*

MUCKERS—*Air powered shovels did the final cleanup before the finishing operations were begun.*

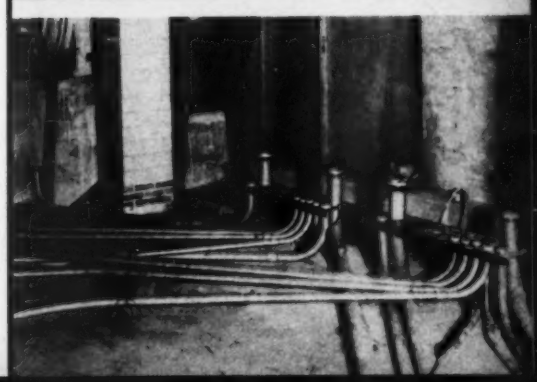
method will be readily apparent when consideration is given to the wide variation of cables used. They ranged from 3-conductor primary power feeders down to signalling and control cables, having up to 330 conductors.

Some of the pictures show handling and splicing operations, now in progress at various manholes, which occur at 480 to 520 ft. intervals throughout the tunnel. To handle, in 520 ft. lengths, cables often comprising three 350,000 c.m. conductors, with 15,000-volt varnished cambric insulation and lead sheath, of course, involves the use of power pulling and hauling equipment. This work has been done in the most modern manner, with every safeguard against injury to these important conductors.

The management problem involved in this job, is one of its most interesting features, but it cannot be photographed, nor will space permit detailed description. The planning, supervision and service of an operation of this size and complexity required executive skill of a high order and a well organized supporting system. No stone was left unturned to coordinate all operations, so that upwards of 100,000 manhours of electrical labor involved in this wind-up operation would dovetail to best advantage. It was necessary to make every operation clearly understood between the general office, the field office and the six or more divisional superintendents. These men looked after crews engaged at pipe work, cable pulling, splicing, equipment erection, wire pulling and the installation of devices.

New job handling methods and installation technique will be readily recognized by the electrical construction engineer in these pictures. In fact, an amazing amount of ingenuity has been applied to developing a new way to install wiring under these abnormal conditions. A visit to this tunnel job in its present exposed state is of absorbing interest. Soon, however, all will be concealed by tiling and there will be visible only the finished tube and the unceasing flow of automobiles, trucks and buses. But, they could not pass, if the electrical contractor had not done his work well.

TILED CABINETS—*Cabinets are set in concrete, flush with gleaming tile. Upper left, a traffic signal box; below, controls, relays, telephone strips, and fire alarm.*



HELD IN PLACE—*At fan-house panelboards, conduits were held by removable steel templates. Runs were locknutted securely, then concrete fill was poured.*

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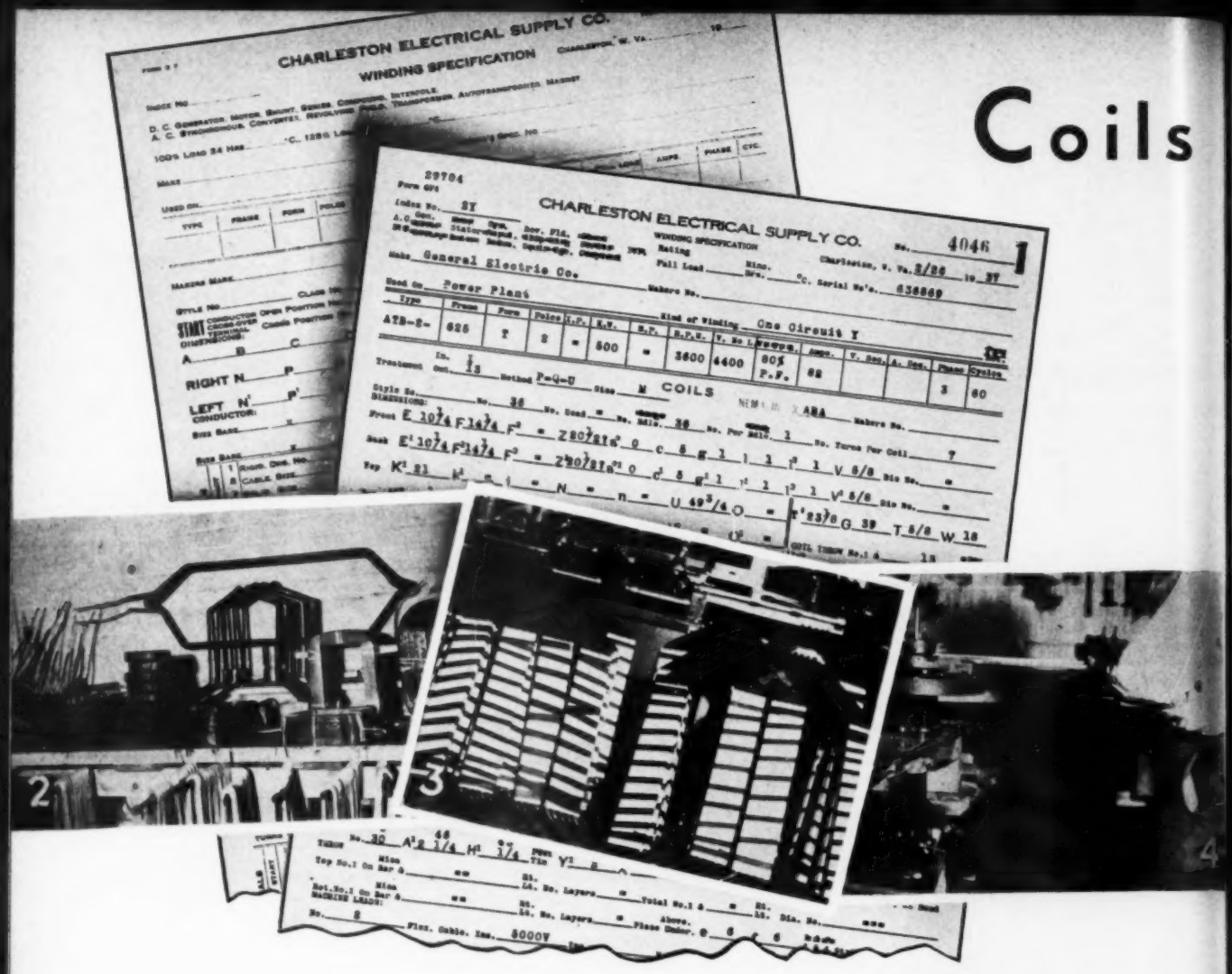
Coils



WHEN the electrical equipment in a coal mine breaks down, there is a rush repair job to be done. Only motor service shops specially equipped for mine work can do such jobs quickly. It is difficult for the most experienced shopmen.

The Charleston Electrical Supply Company thrives on tough jobs of this sort. They have grown into a large organization, because they could render just this kind of repair service. When trouble develops, everybody knows what is needed. Working data, equipment and skilled manpower is there for the emergency, built upon a foundation of over 8000 separate sets of carefully indexed coil specifications. Production is kept in high gear by A. F. Beck, the company's general manager, and his son C. A. Beck, who directs the various shop departments.

In this plant in Charleston, for example, from 60 to 75 field coils must be made or rebuilt each month, also all sorts of special armature, rotor and stator coils. To give quick replacement service, certain commonly used coils are made up for stock in lots of 10 sets in sizes up to 300 h.p. This gives all the economic advantages of standardized, long-run production, while it also levels off the work-flow for some 30 employees. Steady employment minimizes turnover and lends itself well to employee training.

So, the making of coils by specifications has been a natural outgrowth. For with every care given to exact dimensions, correct physical and electrical make-up, and the use of only the best of materials, there is also speedy production. For example, 36 stator coils for a 4400-volt, 500 k.w., 3600 rpm., G.E., ATB-2-625 machine, rushed through for a breakdown order, were handled in winding time 12 hours; coil spreading 18 hours; all insulating and finishing, 50 hours.

This job called for making loops, comprising 7 turns (2 in parallel) of .101 by .153-in. triple cotton covered wire. Spacers of .010 by .342 red rope paper were used. The loops were preheated, impregnated and baked. Then spreading, tinning, two impregnations and bakings. Binder tapes were applied for the dip. Each 39-in. long and 18-in. wide coil received, at the hands of women tapers, two layers of mica, and silk half-lapped, then three layers of .007 bias linen tape. The 21½-in. long cell area received in addition three turns of .012 mica and a half-lap covering of linen tape.

The high price of copper has led to the development of equipment with which to unwind and clean up and rebuild old burnt-out field coils at a profit. Sometimes the job is reconditioned to a super-specification, because extremely severe service conditions warrant doing a better insulating job than was originally done at the factory. So, when there is breakdown trouble in the Kanawha River Valley, it is well taken care of. Coils are made to specifications, and they fit.

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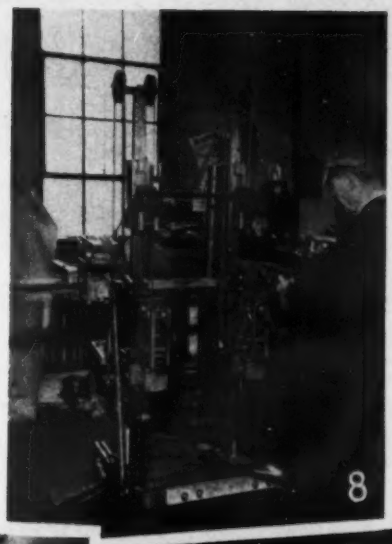
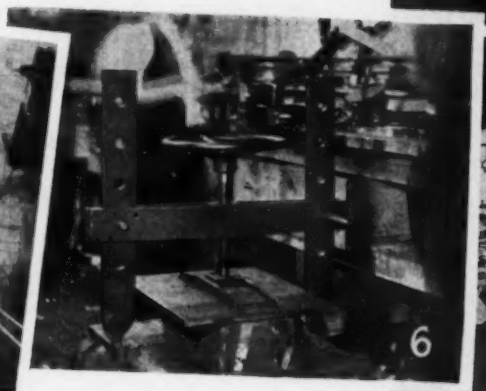
by Specification

How Special Coils Are Made for West Virginia Mines and Factories





1 SPECIFICATION FORMS—*are the heart of this company's operations. Reference binders now hold some 4500 of these forms for armature, rotor and stator coils, and another 3500 for field coils.*

2 COIL VARIETY—*as evidenced by this chance assortment, is a production problem that is overcome in quick time. Experienced designers, workers and special equipment do the job.*

3 FINISHED PRODUCTION—*like this partial view of 240 coils for a 1000 k.w. generator, must meet exacting physical and electrical requirements for years of hard service.*

4 KNUCKLE BENDING—*of heavy flat copper coils is done with properly designed jigs and bench benders, shaped for various coil specifications.*

5 LARGE LOOPS—*like these for a 500 k.w. machine get seven turns of triple cotton wire with red rope paper spacer between. The dangling spacer is visible in front of the operator.*

6 FIELD COIL PRESSES—*clamp the re-insulated mass for preheating, while an adjustable inner form maintains the exact inner dimensions. This press has a steel bed plate, with a rectangular hole cut out for forcing electrically-heated air through the core under pressure. Better impregnation and baking of these coils is claimed to result.*

7 COIL TAPING—*keeps nine young women on the payroll. They work 5 days at 7.2 hours, from 8 to 4 with an .8-hr. lunch period. With 4 hours work on Saturday this makes a 40-hour week. Their pay runs 35c to 42c per hour.*

8 HEAVY-DUTY SPREADER—*tension as needed for extremely large stator coils resulted in this space-saving, up-and-down action outfit being designed. It will handle a loop 90 in. long, a 50-in. slot length, and 36-in. coil spread, and will clamp a coil mass of 1¼-in. by 2-in. overall cross-section. Foot-treadle has a fulcrum ratio adjustment. Made of heavy adjustable steel bars, with 5/16-in. steel spreading, pulling and balancing cables, it has a ratchet-and-pawl treadle engagement device, which holds the spreader in position while another treadle movement is made.*

9 SERVICE FAILURES—*in field coils occur frequently with heavily-abused mine machinery. Heavy ribbon-copper coils are salvaged by cleaning off old insulation, after which they are re-insulated and reformed to exact dimensions.*

10 PRESSING OUT—*kinks in springy metal requires quick-acting cold presses. This cold press operator applies positive 4-way floor treadle pressure to flat copper ranging up to .090 in. wide and .030 in. thick.*

UMI

Six School Fires Every Day

Electrical Contractors Are Concerned—But It Is More Than a Responsibility—Behind It Waits an Opportunity—A Market

AFTER you went to work this morning, your wife buttoned up the kids and started them for school. What of it? Well—six school houses are going to catch fire today. It starts you thinking. Suppose it was *your* turn this time!

In 1935 there were 2200 school house fires. There are no figures on last year—but it was no better. This year's total is now piling up—probably still averaging around six every day. Most of these fires are stopped without loss of life. But any one of them—in your town, maybe—may result in a disaster. For the insurance people say that 80 per cent of the schools are inadequately protected against fire and accident.

Too many of these fires have been fatal, tragic—look back over the record. In the Collinwood, Ohio, school, 174 children were lost, just a heart breaking mass of little bodies lying charred in the smoking ruins. In Camden, S. C., it was 75, in Peabody, Mass., 22, in Plaza del Rey, Cal., 24, in Bobbs Switch, Okla., 36. In New London, Texas, this year 400 youngsters died, while they were sitting in the class rooms that the grown-ups had provided. It was an explosion, this time, and the horror of it chilled your blood for days.

"My God!" you say, "why haven't I heard about all this before?"

Nobody knows. The National Electrical Manufacturers Association has just dug it up. And they were so appalled that they brought together the national associations of the fire chiefs, the automatic sprinkler and wire glass people, the municipal signal and fire protection groups, and the electrical contractors. They are setting up a Bureau of Institutional Safety to do something about it. Matthew Porosky, a vice-president of NEMA, is acting chairman. They are now ferreting out the facts and they make you gasp. For this land is likewise full of hospitals, homes for the dependant, penitentiaries, asylums, theatres and auditoriums, where there are hazardous conditions as bad as in the schools.

And to go on—in these 250,000 schools, for 200 days every year, sit 26,000,000 children, from five to seventeen years old. The people of America have $6,500,000,000 invested in these schools—not including colleges and universities. The money loss in these fires, in 1935, was nearly $5,000,000.

THIS MUST STOP—*Last year 2200 school fires menaced the children of America—your children. About 12 per cent were from electrical causes. But better signal and alarm systems would have saved many lives*

Faulty wiring and heating systems were the principal causes. But inadequate fire detection and alarm systems also cost many lives.

"All right—so what?" you say—"What can I do about it?"

And that brings us to the point of action. For the electrical contractor is in this situation up to the neck—and has not realized it. As a father, as a friend of children, as a citizen, as an electrical man and through his interest in his own business—he has a responsibility here that he cannot dodge. But he also has an opportunity. For profit calls—as well as duty.

In a list of 875 school fires, in which causes are classified by the National Fire Protection Association, "eletrical causes" head the list, responsible for 104 known fires. This is 12 per cent of those reported, and some of the 300 listed as "cause unknown" were undoubtedly of electrical origin. Among the 104, identified as electrical, were "defective wiring 42, short circuit 16, appliances-left-on 8,"—and so on. But that is not all of the electrical contractors' responsibility. Among the other major causes of school fires are "spontaneous ignition, matches, defective heating equipment and over-heated flues." And when fires start from these or any other causes, while school is in session, the safety of the children depends on alarms and signals.

But you still ask, "What can I do about it?"

Here's the final answer—Go Do This!

1. First get the facts. Write for the booklet, "School Fires," published by NFPA—price 25 cents. Study it.

2. Visit your local schools. Examine the condition of the wiring, the adequacy of alarm and signal systems.

3. Write a report presenting the situation as to fire hazard in each school. Submit recommendations to make the wiring safe, to make the signalling adequate and sure.

4. Talk to the superintendent of schools. Go before the school board. Discuss it with the mayor, the fire chief, the chief of police, the parent-teachers association.

5. If they don't act, give your data to the leading newspaper. Talk to a few leaders of local opinion, such as the most progressive preacher, the coming young politician. Get public opinion moving.

6. Close a contract or two to modernize the local schools electrically this summer—and other institutions—as a start. Stay behind this idea. Work for larger appropriations in next year's budget. Keep it coming.

"But that will be slow," you say.

Perhaps it will. But do it anyway—as a father—as a citizen—as an electrical man, who knows what ought to be done. Then as a business man, cash in on this market that waits beyond—

7. While the topic is in the public mind, go after the factories. Show them where they need better wiring and better signal protection, to reduce their fire hazard. And in the factory, of course, reduced insurance premiums will gradually repay the cost. Also, this modernization will offer economies that will help land the order.

But—*Six school fires every day*—Start from there!

How to Use The Handbook—3

Here is guidance also on the matter of contracts and specifications

There is more to this electrical construction business than wiring. So the new handbook presents a section on contracts and specifications. Mr. Slauer, in concluding his series of interpretative articles, tells why this material was included, what it is worth to you.

WHENEVER a building is to be constructed or modernized, some form of contract must be drawn between the parties involved. Naturally the detail, which such forms include, depends to a large extent on the magnitude of the job. Nevertheless, even small jobs can be greatly benefited by a clear understanding of all factors involved. In the new Handbook on Interior Wiring Design the basic information required for the usual document is listed and explained.

It must not be supposed that the handbook is a legal treatise, any more than it may be called an architectural guide. However, its relationship to these professions is the same. Almost every electrical job, with the probable exception of repair work, could be benefited by architectural planning and supervision. The architect has a chance to view the project as a whole, rather than in the technical detail of any one part of the job. Similarly it is quite probable that every contract could be benefited by legal advice. The cost involved, of course, is the stumbling block. So the contractor must learn to improve his own background in these phases of his business, so that he can handle ordinary conditions. What is perhaps even more important, he must learn to recognize special conditions when they arise and know how to proceed with them.

Too Much in Doubt

As everybody knows too much is left unwritten or poorly stated in the average contract. Electrical construction is not and cannot be a packaged article, like breakfast food or cigarettes. There are always many items which may or may not be used, in a certain job, and many ways of installing such items. It is seldom that all these would be equally effective or cost the same to install. The attempt, by any contractor, to build up his jobs from all standpoints—quality, workmanship, adequacy, engineering—usually involves asking a higher price tor the work. The only way that the customer can be assured that this price is justified is to know that other prices are based on lower standards somewhere in the installation.

Those Loopholes

Quite often a contractor has no voice in the preparation of a specification. He is merely asked to submit his bid. Naturally he must take every advantage of loopholes in preparing his bid, since other contractors are doing the same thing. If there seems to be more confusion than normally, it is not uncommon to find some contractor underbidding his own calculated costs, merely to secure the job. After the work is started, the "extras" involved are expected to make up the difference and secure the profit. But if there are no "extras," or if the margin on the whole job cannot be worked into them, the contractor chalks up another loss.

This certainly does not seem to be a sound industry practise. Jobs should be built up for installed effectiveness, not down to the level of the sharpest trader or biggest gambler. And one way to insure this is to pay more attention to contracts and specifications.

In the residential section of the handbook, a specification form for a single dwelling is presented. With slight modifications, this may be used for two-family or other smaller multi-family buildings. The form is divided into two parts—general conditions and installation specifications. The general conditions will tend to remain the same in each community, in which the average contractor operates. Thus this first part may be prepared by filling in a few blank spaces, and left in the hands of a typist for continual use thereafter.

The installation specifications differ for each job, but not as much as might be supposed, except for the drawings which, of course, are different for each job. Such specifications would cover the scope of the work, the type of service, branch wiring, plates, receptacles and so on. A rather easy way to use the handbook form is to prepare a loose-leaf notebook, with one page for each specification article listed on the form. At the top of each page, could be typed, the sample paragraphs that have been fitted to local conditions. Then as the experience on jobs indicates how satisfactory these paragraphs are, comments and data may be added to the pages.

This method is especially helpful where more than one person assists in the preparation or interpretation of the specifications. It is only human nature occasionally to forget certain items, but such forgetfulness may be costly.

Sample Specification

To more definitely illustrate the use of the form, a sample specification is included in the handbook. The house used allowed enough leeway to illustrate the problems. A careful study of this sample will emphasize how easy it is to use the form and how effective such a presentation must be to Mr. Residential Customer, who in almost every case, knows very little about wiring. And what is even more important, it helps to assure that each party to the contract will receive full value. Paring and chiselling will not be eliminated, but they will be exposed.

Electrical work for industrial and commercial jobs is much more varied, and a whole section of the handbook is devoted to this phase. But the basic elements of the contract remain the same—general conditions under which the contractor proceeds on any job, and specification articles which apply to a

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By Richard G. Slauer
Westinghouse Lamp Company
Secretary, Industry Committee on Interior Wiring Design

particular problem. That large jobs involve many elements, may be seen from the list of general conditions prepared by the American Institute of Architects. Some 44 items are listed ranging from instructions regarding drawings to those pertaining to cleaning up after a job is finished.

General Conditions

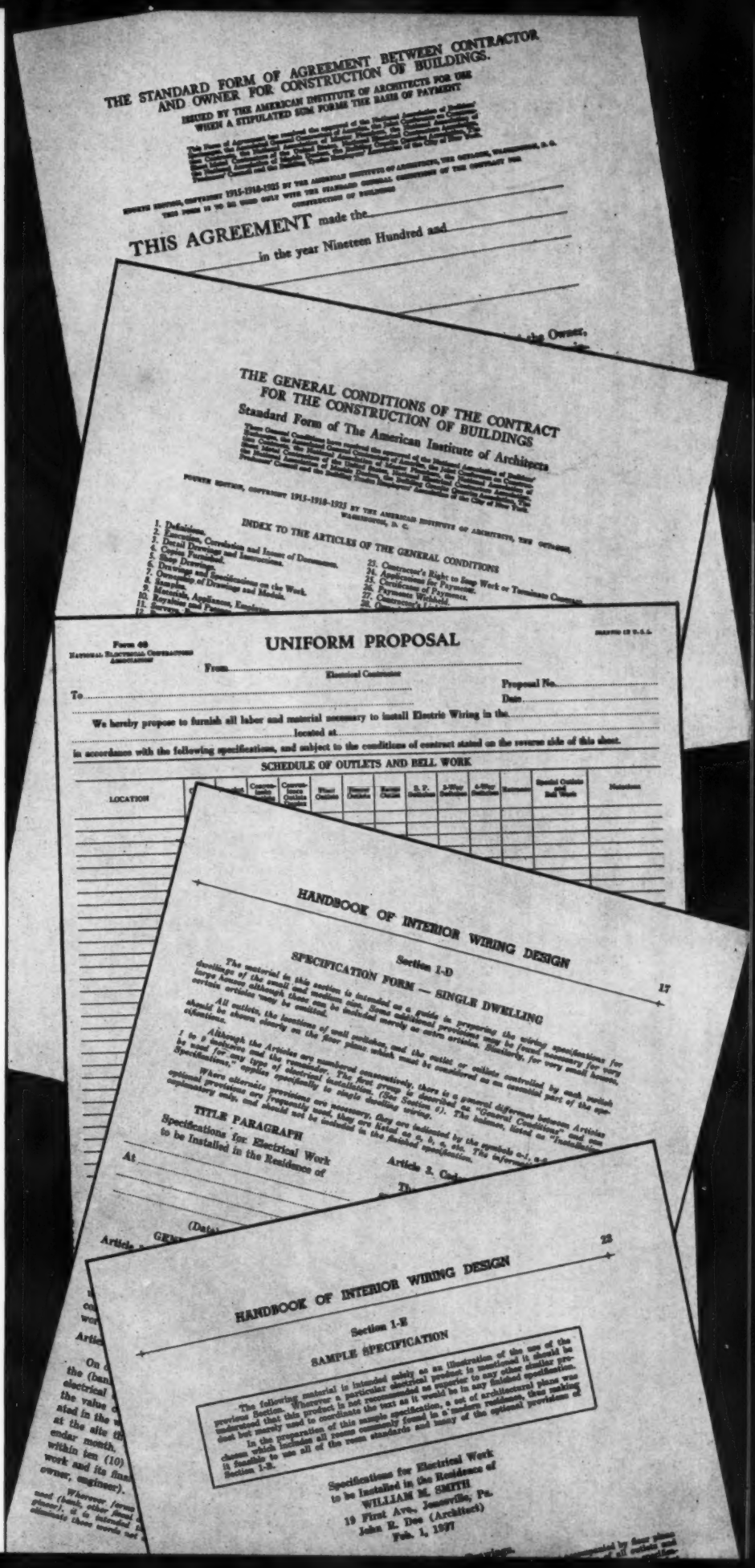
However, on many jobs, a simpler form of general conditions is desirable and usually entirely satisfactory. This is especially true in modernization work, where the electrical contract may include the largest portion of the work to be done. Therefore, a form of general conditions is recommended, quite similar to that used for residential work.

Almost anything pertaining to wiring may be included in the specification paragraphs. An outline covering paragraphs on light, heat, power and auxiliary specifications has been prepared. In many cases the detailed wording of sample paragraphs is included. The point to be remembered, in preparing specifications, is that everything of importance must be included.

By using this outline, the contractor may check back on an architect's specifications. Suggestions regarding missing items will usually be welcomed. Naturally some tact might be necessary, in presenting your opinions, but it is far better to build up a reputation of knowing your work than for being the quickest to take advantage of every loophole. And by pointing out such loopholes before the bid is presented, you make sure that everyone starts from the same place.

So a careful study of this handbook material on contracts and specifications is worth while. Many books and schools have emphasized the engineering and practical side of wiring; but the scarcity of usable material on contracts and planning was the real force behind the production of the handbook. Know its contents and use them.

Electrical Contracting, June 1937


THE STANDARD FORM OF AGREEMENT BETWEEN CONTRACTOR AND OWNER FOR CONSTRUCTION OF BUILDINGS.
ISSUED BY THE AMERICAN INSTITUTE OF ARCHITECTS FOR USE WHEN A STIPULATED SUM FORMS THE BASIS OF PAYMENT
THIS AGREEMENT made the
in the year Nineteen Hundred and
THE GENERAL CONDITIONS OF THE CONTRACT FOR THE CONSTRUCTION OF BUILDINGS
Standard Form of The American Institute of Architects
INDEX TO THE ARTICLES OF THE GENERAL CONDITIONS
UNIFORM PROPOSAL
SCHEDULE OF OUTLETS AND BELL WORK
HANDBOOK OF INTERIOR WIRING DESIGN
Section I-D
SPECIFICATION FORM — SINGLE DWELLING
TITLE PARAGRAPH
Specifications for Electrical Work to be Installed in the Residence of
HANDBOOK OF INTERIOR WIRING DESIGN
Section I-E
SAMPLE SPECIFICATION
Specifications for Electrical Work to be Installed in the Residence of
WILLIAM M. SMITH
19 First Ave., Jonesville, Pa.
John R. Doe (Architect)
Feb. 1, 1937

In Which We Discuss The Terrible Vest Pocket Lads – And Take Our Hair Down And Talk Plain, As A Couple of Old Married Women Can

"NO Profit i

By Earl Whitehorne

WHAT is the matter with electrical contractors? Right now the biggest business opportunity they have ever known is staring them in the face and most of them are indifferent. It doesn't make sense.

In a word, two million new houses are about to be built in America—already started. Everyone of them will be wired. But how many "qualified contractors" are after this business? Most of them say—"We can't touch house wiring. It all goes to the vest-pocket boys. The speculative builders think of nothing but price."

Again, twenty-two million already-built houses need more wiring. The industry has talked about it for years. But ask any "qualified contractor" what he has done about it. The answer is—

"Nothing! You can't sell wiring to old houses. It costs more to get the order than you can make on the job!"

Meanwhile, John and Mary buy thousand dollar automobiles, two hundred dollar refrigerators, hundred dollar radios and spend their money freely for furniture, rugs, clothes, travel and whoopee. Also, the whole power industry makes its living from the domestic consumer. But the contractor thinks he can't sell these American families enough wiring to make the use of electricity convenient, economical and safe!

It would make you laugh—if it didn't rouse your indignation. For either all these contractors are wrong about this or it is such an indictment of the electrical business, we are fools to be in it.

But there is nothing the matter with the electrical business. There is no better industry to be in right now. So what's wrong? Let's take our hair down and speak plainly, as a couple of old married women can.

The trouble seems to be in with the contractor himself. For years he was ruined by easy money. He sold nothing. He lived on the unceasing growth of public demand. When somebody asked him to, he gave a figure and he got enough jobs to keep busy. This had been going on for forty years when the Late Depression hit us. Then nobody asked him to figure. So he took in his belt and lived on his hump, like the camel, doing odd jobs, picking up this and that. And about half pulled through.

Now comes Prosperity again and back into the wiring game have swarmed thousands of wiremen, who kept their bellies full by tinkering through the hard times, and are ready to take any job on a days work basis. The speculative builder—himself tired of lean feeding—is pinching every penny and gladly gives his business to the low price. So the vest pocket lad takes the order and is glad to get it. And who can blame him? And the qualified contractor just says—"Oh! What the Hell!" And there you are.

But for the Love o' Peanuts! Hasn't the qualified contractor anything more to offer than the vest pocket lad? Hasn't he any brains to sell? Hasn't he any experience to sell? Hasn't he some equipment and organization and responsibility and credit and reputation to offer—as well as mere price?

Is there no way to compete with the

MASS PRODUCTION NEEDED—*All over the land are occupied houses—thousands in every city—22,000,000 in all—most of them are over loaded, under coppered. Here is the most urgent job now before the industry and the work must be done by contractors with equipment and organization who can handle them by hundreds.*

Fairchild Aerial Survey, Inc

Ewing Galloway, N. Y.

WIRING PLUS BRAINS—*All over the land are new homes building like this. The people who will live in them want full comfort wiring but many will only have facilities for bare necessity. But it is not the fault of the vest pocket lads who do so much of the wiring. We should blame it on the qualified contractors who fail to do a selling job.*

House Wiring"

vest pocket lad but on his own level? Isn't it about time to stop oiling our conscience with the old patter about his having no overhead, because he carries his business in his clothes? Must we just lie down and let him trample on us? Is there no way to compete?

"No there isn't! Because the speculative builder is not interested in anything but price." Somebody pipes up.

"The Hell he isn't!" say I, right out loud.

Now the thing the builder is really interested in these days is selling houses. His mind is on profit—on turnover—on making money—just like anybody else. He squeezes the electrical contractor for a low price, because he has found out that it works. But does he squeeze on bath rooms? Does he squeeze on kitchen tricks? Does he squeeze on closets? Does he squeeze on all these things that put modern styling in a house, and make it sell quickly?

Well, then, it is about time the electrical contractor began to wake up and sell some brains with his house wiring. It is about time he quit just giving the speculative builder half-hearted, chiseled bids and began to be a bit helpful in the building game. It is about time he went to work with this smart business man—the speculative builder—to show him that bare necessity wiring does not help sell houses but that well styled, full comfort wiring will. It is about time he began to feed some ideas to this builder and show him how to put some electrical tricks into his houses that will speed up his turnover and make him more money. It is about time—well, you get my point.

To put it in a few well chosen words—the electrical contractor can throw house wiring back on the track, just as soon as he wants to do some creative selling. If he will offer the speculative builder a service that is better than that the vest pocket lad provides, he will get the business. And the price will be what ever he makes it worth to the builder, by the thought and style and comfort that is in it. House wiring need not be lost to the qualified contractor. But it won't come back asking to be kissed.

And then one more point—these twenty-two million underwired houses—what about them? They will not be wired by the vest pocket lads at all. This big job can only be done by a qualified contractor who can organize a big job and finance it and handle it.

"But," you say again, "No big contractor can fool with rewiring houses."

No, not with rewiring houses—one by one. But if a smart, big contractor were to wake up to the fact that there are, say, fifty thousand under-wired houses in his town and decide that he would like to whirl in and wire up five thousand of them—well, that would be something else.

And suppose the league, with the cooperation of the power company, put on a local drive to sell full comfort wiring to these five thousand houses—what then? Well, unless they are pretty dumb and forget to do good advertising and hire good salesmen in the campaign, and offer easy payments, somebody will wire a lot of houses.

In the April number of this clarion of liberty, I suggested that we get a gadget that would show up inadequate wiring, by checking for voltage drop and insulation leakage. I urged that we use the same approach, the same technique that worked so well in the Better Light—Better Sight campaign. The gadget for this selling job is on the way. The industry has responded to the idea to a degree that is most promising. The job can—and is going to be done.

The only question worrying me is—*Does the qualified contractor want to cash in on this business?*

Are we salesmen or—well you say it!

UMI

New Lighting FOR STORES

SILHOUETTE SIGNS—*Lights recessed in the wall case ceiling give indirect illumination and silhouette letter signs.*

CENTER LUMINAIRE—*This Chicago Cushman Bakery combines glass plates, flood lights, case and cove lights.*

INTERESTING progress is being made these days in devising new lighting treatment for stores. The modern contractor is free of the old limitations in lighting equipment. He can go beyond pendant fixtures and wall brackets and use light for decoration as well as illumination, and immediately that broadens his market. For men will often spend money for style and show, when they will not invest it in wiring or other operating improvements.

These pictures are good examples of the way coves, light boxes, light ports, luminous elements and other devices are now being used to provide better seeing and at the same time restyle the store with light. And contractors are doing the work.

1 Cushman's Bakery, at 705 N. Michigan Ave. in Chicago, is 12 ft. by 20 ft. with an 11 ft. ceiling. The center of interest is the display counter, illuminated by ten recessed louvered floodlights with mirrored glass reflectors, and 200-watt Mazda lamps. For general illumination, there is a large frosted luminaire made up of two tiers of glass. The upper tier is 2 ft. by 6 ft. with a smaller plate suspended 22 inches below the larger one. Above this plate are located twelve 40-watt Mazda lamps.

Additional indirect lighting is given by reflectors above the wall cases, on 8-inch centers, with 40-watt lamps. There is special lighting in each wall case from three 40-watt tubular lamps in concentrating reflectors. Approximately 15 footcandles are provided throughout the interior.

2 In remodeling Mandel Bros., State Street, Chicago store, in the reception room to the beauty shop, they built in luminaires, as a basic part of the design in the side walls and columns. The panels vary from 9 to 16 inches in depth, with ten 75-watt Mazda lamps in each. Luminous capitals, 2 ft. high, are provided for the three columns. The central column has 32 lamps of 25-watts and the two which appear as pilasters have five 75-watt lamps each.

The canopy over the desk has 37 lamps of 60-watts. The room is 38 ft. wide and 45 ft. deep with a 10 ft. ceiling. The walls are covered with warm, greyish brown hardwood and the ceiling is cream.

3 In conception, planning, and execution, the illumination of the S. H. Kress & Co., Fifth Avenue store, New York, is outstanding. The main floor illumination averages 50 footcandles, with 100 on the side display cases. This high light combines direct lighting through ceiling ports, with indirect lighting from the 18 pendant fixtures, and projectors over the wall cases.

There are over 200 louvered units recessed in the main ceiling, equipped

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LUMINOUS CAPITAL—*Panels in walls and columns give the Beauty Shop unusual charm in Mandel Bros., Chicago store.*

MOULDED COVES—*A false ceiling over the counters, provides indirect cove lighting and louvered flood lights downward.*

By DEAN M. WARREN

General Electric Company, Nela Park Engineering Department, Cleveland, Ohio

BUILT IN LIGHTING—*Bullock's Wilshire Store, in Los Angeles has direct light from recessed units in the ceiling and decorative light in silver wall bands of diffusing glass, running up the sidewalls and into the ceiling.*

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FIFTY FOOTCANDLES—*The famous Kress Fifth Avenue New York store uses indirect pendant fixtures, ceiling ports and coves.*

with mirrored glass reflectors and 500-watt Mazda lamps. The louvers are painted so that, from the floor, they look like glass moulded into a pattern.

There is also another group of about 100 units located approximately five to ten feet in from the side walls and running completely around the store. These are also equipped with 500-watt Mazda lamps and serve the more important counters. Around each wall are wall cases about six feet high, in the tops of which are 500-watt lamps in directional reflectors. These give indirect lighting and also emphasize ornamental plaques, built into the side walls.

4 The Davenport Store, Greenville, South Carolina, is 18 ft. wide, 44 ft. long, with a 13 ft. ceiling. Eight 500-watt indirect light boxes are located on top of wall cases and wired, two boxes per circuit. Sixteen footcandles are obtained.

5 The Nedli Bakery Shop, in Chicago, uses cove lighting located above the center section of the ceiling. The cove is of molded plaster and houses 40-watt Mazda lamps on 6-inch centers. The ceiling above the cove is finished in white, while that of the suspended area is buff, like the walls. The room is 15 ft. by 25 ft. with a maximum ceiling height of 11 ft.

To emphasize the merchandise, mirrored glass reflectors, louvered to cut out direct rays, are mounted flush in the suspension ceiling, directly over the counter. The units are on 4 ft. centers, equipped with 100-watt Mazda lamps. About 30 footcandles are provided over the display area.

6 The Smith Smart Shoe Store, in Chicago, has installed 74 Mazda lamps of 60-watt, on 12-inch centers, in a chromium lined reflector with glass cover. The reflector is recessed in the ceiling directly above the box shelves. The lamps are wired on alternate circuits to produce two levels of illumination.

The cove silhouettes cutout letters on the top of the shelves. At the rear of the store are two small wall display niches, illuminated from the side by 25-watt lamps on 8-inch centers, in a continuous trough reflector. This space is 18 ft. by 40 ft. with an 11 ft. ceiling.

7 Bullock's Wilshire Store, in Los Angeles, has built in its lighting. Between ceiling beams are pairs of flat rectangular boxes of diffusing glass, bound in metal. Above each are four 150-watt lamps in silvered reflectors.

Then rising vertically to the ceiling, from the tops of the wall display cases and built into the marble wall surfaces, are wide bands of diffusing glass, which transverse the ceiling for a few feet and then end abruptly. Overlaid metal columns divide each band into five vertical strips. The recess in the wall, back of the glass, is sufficiently large to permit the use of 150-watt lamps on 24-inch centers.

* * *

Pictures like these are helpful in showing other merchants the possibilities for making the lighting of their stores distinctive. They suggest ideas for emphasizing the architectural features of each interior, to take advantage of its own character. It will pay therefore to show these pages to those merchants whose light needs a bit of modern styling.

LIGHT BOXES—*Eight 500-watt indirect units flood this Davenport store in Greenville, S. C., with strong comfortable light well distributed.*

CHECKING UP — *Engineers for Underwriters' Laboratories sampling armored cable in the manufacturers' warehouse, in the process of inspecting under the Label Service.*

Taking Risk out of Metal Systems

A check-up of the qualities required of armored cable, conduit and raceways to make them safe.

By H. B. Smith
Associate Electrical Engineer
Underwriters' Laboratories, Inc., New York

Because armored cable, flexible and rigid conduit, electrical metallic tubing, and the various forms of metal raceways have the appearance of safety, they are apt to be taken for granted. But they are protected by standards which have been developed over an extended period of examination, testing, and counterchecking. Also, a continuous factory inspection service is maintained at the plants where these products are made. The Laboratories' Label Service inspectors check the current output and stock of the manufacturers, to insure that all features having a bearing on fire and accident hazards are in compliance with requirements.

These products, of course, must be such that they can be installed readily in accordance with the National Electrical Code, and easily identified and inspected after installation. Certain essential factors involved in the safety and reliability of these metallic-covered wiring systems are common characteristics. For example, mechanical protection must be afforded to the insulated conductors, the degree of protection depending largely upon the thickness of metal employed. Various degrees of protection are required against arcing or burnout, this protection being dependent upon the tightness of the enclosure, as well as the thickness of metal used. Beyond that each system must meet special conditions of its own.

Rigid Steel Conduit—The tube from which conduit, elbows, and nipples are made must be of mild steel, having a truly circular cross-section and uniform wall thickness throughout, in order to permit the cutting of clean true threads. The welding of seams, if any, must be very thorough. It is quite essential that the steel be cleaned of all scale and rust so that protective coatings will be smooth and adhere well, and the product is carefully inspected for this important feature following the pickling operation.

As a protection against corrosion, coatings are required on both inside and outside surfaces of all rigid conduit and are ordinarily zinc or enamel. Enamel coatings are tested for flexibility, by bending special samples of thin sheet metal, to which the enamel has been applied, as well as by bending samples of the conduit itself. The toughness of enamel is checked by means of a knife test, in which the coating is sliced from a representative sample of conduit. There is also a smash test, in which a sample of coated conduit is struck a hard blow with another piece of conduit of the same size, to determine how the enamel will stand up under conditions of shipment and installation.

Zinc coatings are tested for flexibility by bending samples of conduit. The adequacy of zinc coatings, that is, the quantity and distribution of zinc, is checked by chemical analysis and, in the regular factory inspection work, by the copper-sulphate dip test, on representative samples of conduit. Threads

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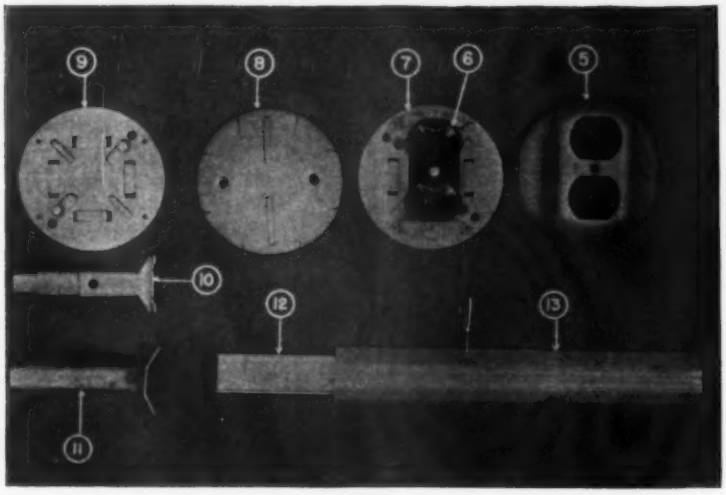

SYSTEM PARTS—*Photograph of metal moulding parts, tested by Underwriters Laboratories and reported to the manufacturer.*

METAL MOULDING TEST

5. Cover steel (Electro-galvanized) min. thickness 0.040 in.
6. Listed duplex receptacle 10A—250V; 15A—125V.
7. Sheet steel base plate, electro-galvanized min. thickness 0.040 in.
8. Cover steel electro-galvanized min. thickness 0.040 in.
9. Sheet steel base plate, electro-galvanized min. thickness 0.040 in.
10. Sheet steel base plate, electro-galvanized min. thickness 0.040 in.
11. Cover steel electro-galvanized min. thickness 0.040 in.
12. Base of raceway, sheet steel electro-galvanized 0.040 in. min. thickness.
13. Cover of raceway, sheet steel electro-galvanized min. thickness 0.040 in.

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on conduit and couplings are required to be full and clean cut and to comply with the American Briggs Standard for Tapered Pipe Threads. The wall thickness is checked by weighing standard 10-ft. lengths of conduit.

Electrical Metallic Tubing — Being somewhat less rugged with its thinner wall than rigid conduit, electrical metallic tubing is not recognized for use under all the conditions where conduit may be employed. However, it is similar to conduit in many respects; except that it is not threaded, because it is always used in conjunction with threadless fittings and connectors. But the product is checked according to the same general program of inspection and tests as rigid conduit.

Armored Cable—Armored cable differs from the other metal-clad wiring systems in that it is complete with insulated conductors which are standard, rubber-covered wires. The construction of armored cable is required to be such that a suitable insulating bushing or its equivalent protection can be inserted readily between the conductors and the armor at each termination of the armor.

The minimum thickness of the steel strip used for the armor is specified, as well as the nominal overall dimensions of the finished cable. A further check is also made on the strip, by determining the weight of the armor without the conductors. Zinc is required as a protection against corrosion, and as in the case of rigid steel conduit, the adequacy of the zinc is checked by the copper-sulphate dip test.

The finished product is tested for tensile strength at 300 lb., the resistance of the armor, the tightness of the armor on the conductors, elongation, and flexibility. A dielectric-strength test of 1500 v. is made between each two conductors and between each conductor and the armor.

Flexible Steel Conduit—Flexible conduit bears a close resemblance to the armor of armored cable and, accordingly, is checked and tested in much the same way. Internal diameters are specified for the formed conduit, as well as the minimum thickness of the strip used. An additional check is made on the strip by determining the weight per foot of the finished product. Zinc is required, as the protection against corrosion, and is checked in the same manner as for armored cable and rigid steel conduit. The product is tested to 200-300 lbs. for tensile strength, and is bent around mandrels to determine its flexibility.

Surface Metal Raceways—Whether of one-piece, or more frequently of two-piece construction, a capping and a backing surface metal raceway affords a convenient method for enclosing and protecting conductors, where concealed wiring is not feasible. It is a sheet-metal product, the minimum thickness of the metal being 0.40 in. The capacity of the raceway is such that it will accommodate not more than ten No. 14 Awg conductors.

With respect to protection against corrosion, surface metal raceway is checked both for enamel and zinc coatings in approximately the same manner as rigid steel conduit. Elbows, T's, crosses, couplings, which are supplied for use with surface metal raceway, are judged under the same requirements as the raceway. Special boxes and other fittings are supplied for use with surface metal raceways.

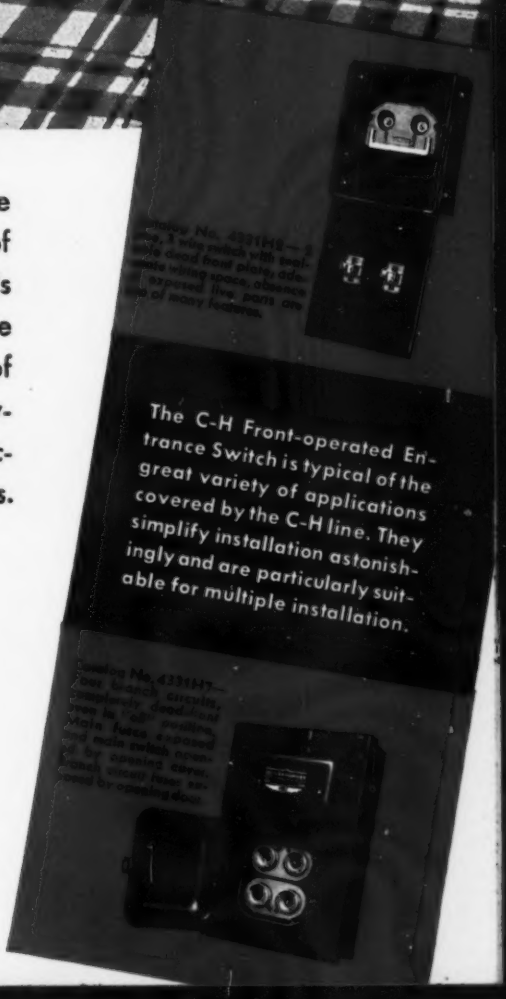
Metallic Underfloor Raceways—Metallic underfloor raceway is required to be made of steel not less than No. 14 U.S.S. guage in thickness. It must have a cross-sectional area of at least 1¼ sq.in. and to be not less than 1⅛ in. in external width. Otherwise, it is judged in very much the same way as rigid steel conduit—particularly with reference to cleaning, welding of seams, and protective coatings.

Underfloor raceways differ from the other wiring methods mentioned, in that they have provision for floor inserts, some of which are preset and some installed after the raceway is in place. Special boxes and fittings are provided and these, together with the metallic duct, are required to be suitable for installation in concrete or concrete fill.

Wireways and Busways—At the present time, there are no adopted standards for these products. The individual makes are more or less special in design and construction and are judged on their merits. Particular attention is paid to mechanical strength, however, thickness of metal, corrosion protection, methods of installation, and the boxes and fittings which are provided. Wireways are checked for their capacity to accommodate insulated conductors, and busways are checked for the current-carrying capacity of the buses.

New standards of living demand new standards of equipment

"Streamlined" Kitchens are a typical example of the electrified home equipment people are buying today. They want new standards of comfort, convenience and labor-saving. And these new standards prove a desire for quality and dependability. Merchandisers who are thriving in this market give them what they want. The very beginning of a dependable electrical installation is Cutler-Hammer Meter and Service Entrance Equipment. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus*, 1306 St. Paul Ave., Milwaukee, Wis.


The C-H Front-operated Entrance Switch is typical of the great variety of applications covered by the C-H line. They simplify installation astonishingly and are particularly suitable for multiple installation.

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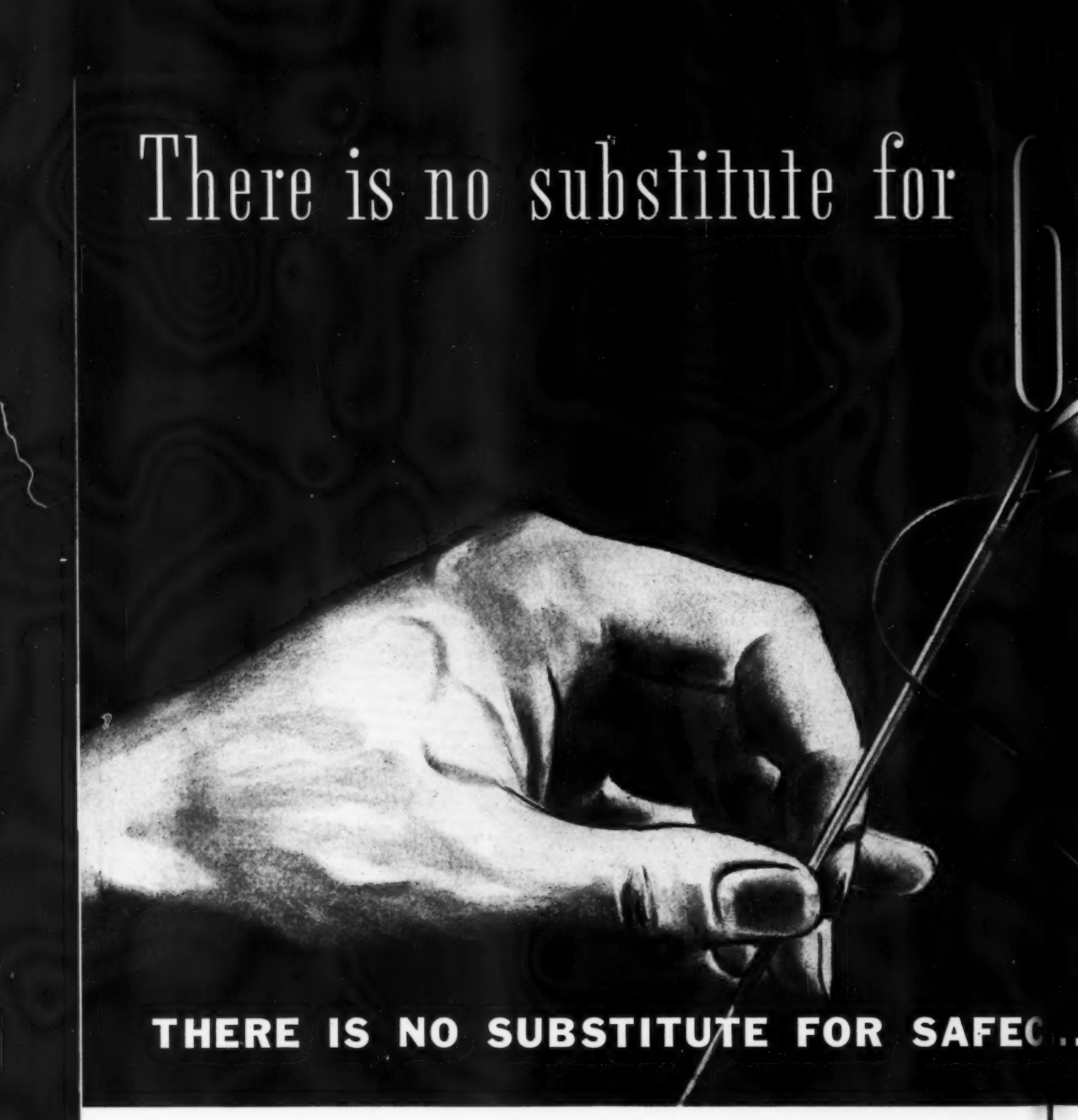

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FLAME RETARDING MOISTURE RESISTING

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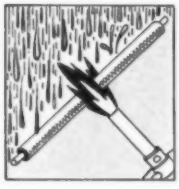
• **Protected by Safecote braid, the most recent development in fire and moisture retarding braids.**

• **Hazard Firekrome Safecote building wire will last as long as the building itself. Hazard insulation is noted for its long life.**



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TOOLS ON THE JOB

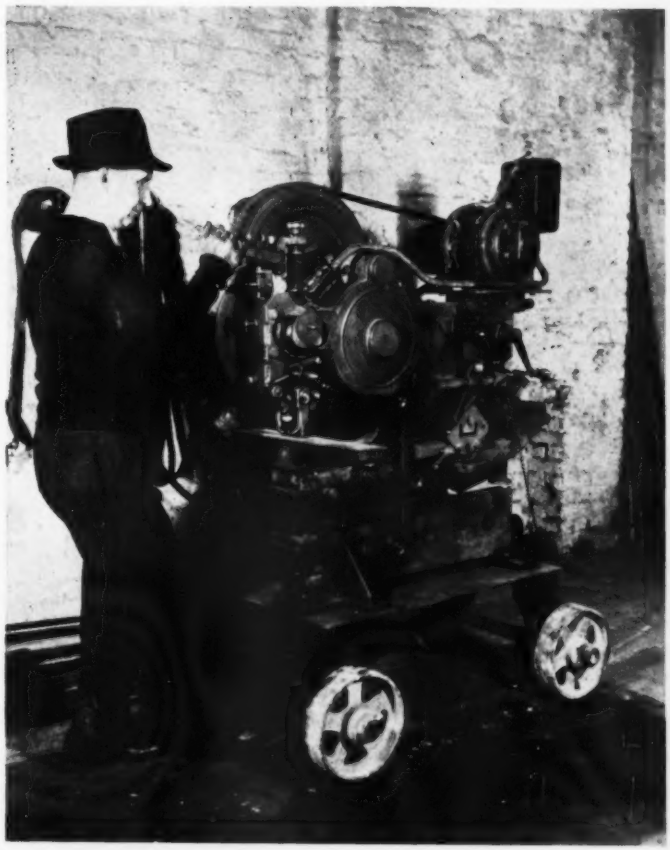
Tooling to Cut Costs

Modern construction has complicated the process of electrical installation. Exacting schedules require specialization and fast work. Tools are more important than ever before.

TOOLS are playing a steadily increasing part in electrical construction. Contractors are buying more and more modern specialized tools for three very practical reasons. They enable a workman to get more done in a day. They get that work done with less fatigue. With them, a mechanic can do more kinds of work well.

A Detroit contractor recently pointed out that the present-day industrial electrical wireman is becoming very much a fabricator of copper and steel and must be equipped as such. A modern industrial job calls for far more than threading, bending and cable pulling tools. He must be ready when there are racks and hangers to be fabricated, busbars to be assembled, masonry to be chased or drilled, steel structures to be punched, drilled, tapped or welded. And this work can not be done with bare hands.

Moreover, the conditions under which this kind of work is done have changed in recent years. Commercial and industrial modernization is often driven through in massed week end operations. This calls for highly organized crews. If working equipment fails during the wee hours or is inadequate, there is hell to pay. Somebody stands to lose a customer and a lot of profit.



PUNCH AND SHEAR—*Fabrication of hangers, racks and busbars with power equipment. Punch and shear capacity 65,000 lb. per sq. in., to take 1-in. rod or square bar, 3 by 3 by ½ L, 2 by 2 by 5/16 T, or ½ flat bars.*

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So, in 1937, the skilled electrical worker is expected to produce to exacting schedules. To do this he must have equipment to meet a wide range of tasks. Tools must be of a type and condition to cut down on wasted energy and to speed the job. They must be plentiful enough to permit everyone to work efficiently, all the time and with maximum safety.

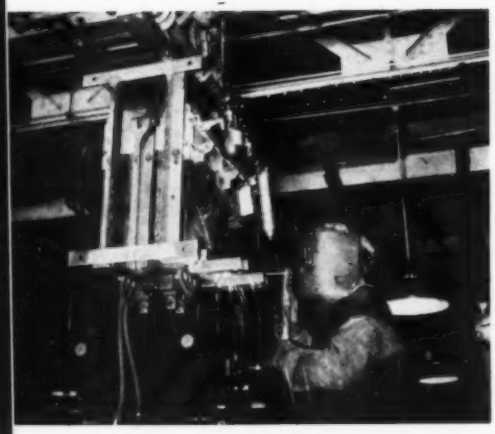
Tools have become a part of every estimate. They must be figured into every job. The selection of tools for the job has become as important as the selection of material, because they control the cost of installing that material. Tool equipment available is more important than material available, because you can order wire and pipe for rush delivery but you can not teach men to use new tools over night.

The tool inventories of many contractors hark back to former days of slow jobs and big crews. Just how efficient they are, and just how they fit into 1937 construction methods is an important question. It all calls for study. What tasks can motors do for your men? How about the new tools for cutting, threading, bending, drilling, pushing?

Modern industrial buildings are becoming so complicated that electrical work must be carefully planned. It has less installation leeway than in former years. As a result, some contractors have already put electric welders to use for spotting conduit to steel trusses, columns and housings. Drilling or burning is not permitted in many factories, so starter racks, conduits and cabinets are being welded to the structure. Small operations—hole-drilling, bus-bar cutting and polishing, raceway and knockout sawing—are being mechanized.

It is the modern way of doing things. It is progressive. It is economical. It is smart. Tool planning on any job may mean the difference between profit and loss.

Tool Economies on Conduit



WELDED ON—*Drilling and bolting gives way in steel buildings to a new installing method—welded-in-place frames, racks, hangers, and conduit too.*

THE art of installing conduit involves more than physical appearance. While the real test of mechanical skill is in the makeup of nice looking bends, sweeps and dog-legs, there are yet other important factors—mechanical and electrical safety, for example.

To install conduit work with reasonable speed, and yet have it mechanically secure and electrically safe, is not as easy as it sounds. It must drain properly, exclude moisture and gases, leave no raw metal exposed to corrosive gases or atmospheres, and provide easy-pulling raceways; plus the pleasing, finished appearance. And it can not be done without both skill and good tools.

The steady expansion of hazardous industries has placed greater responsibility upon the conduit crew. Explosion proof fittings must be connected with extreme accuracy. Unions and sealing boxes must have tightly fitted conduits. Fume-laden or damp locations require tight joints, proper drainage, condensation seal-offs, and breathing points along the runs of conduit. All this exacting work takes extra man-hours. Efficient tools must be employed.

There is no better example than in the ban on running threads, which is to be a requirement of the next code. This rule grows out of trouble from poor equipment—resulting in conduit with the metal chewed up by dull threading tools and insecure joints due to poor bending. Over-threading takes additional labor, exposes raw metal unnecessarily to corrosion and is objectionable to careful inspectors. Worn out dies take more labor and cut into the contractor's profits. Modern threading tools prevent these troubles.

What tools are needed, then?

First comes the bending equipment—hand and bench benders for sizes below 2 in., and power benders for the larger sizes. In the hand types, there have been improvements to shoes and guides, that permit more accurate bending radius, length of stubs, clearances, and off-sets. Power bending equipment should be selected to suit job conditions. Light-weight hydraulic benders are available that move along with the work. Heavy-duty machines are used for big jobs, where pipe bending is done at fixed locations, when there is enough large pipe bending to warrant setting them up. But on all jobs, where there is much large conduit to handle, the cost of bending or off-setting will run high, if the men must rig up improvised snubs and blocks.

After bending comes the cutting and threading. Here power methods save cost, but from bench-type machines and mule-driven outfits to the heavier floor models, their value must be ascertained on the basis of job operations. A small job, where only a few sizes of small conduit are involved, will not justify anything but hand threading equipment.

Speeding the Conduit Job

PIPE WORKMANSHIP—*1. A one-man portable hydraulic bender that follows the work; 2. Chain tongs for making heavy pipes secure; 3. Heavy-duty motorized bending made mobile; 4. Power for sawing thick-walled conduit squarely; 5. Multiple power saw takes fifteen ¾'s at a time;* F. *Motorized threading speeds mass production;* G. *Graceful sweeps require brute-powered tools;* R. *Stocks and sharp dies a-plenty spell job efficiency;* T. *Pipe pushers save expensive pavement breaking.*

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But always the important thing is to have sharp dies. Die-stocks must be plentiful or universal, to avoid expensive die-changing, for cutting various thread sizes. Mechanical threaders are also valuable for economically working up odd pipe scraps into nipples.

Power driven pipe-cutters or hacksaws have come to the fore too, since some specifications require conduits to be cut with a hacksaw. One large contractor recently set up a power saw outfit to cut pipe, while yet in bundles, and it works well. The fabrication of conduit racks and hangers has also justified the use of power shears and punches, bolt threaders and welding.

Also, difficult and costly pavement breaking and trench digging jobs are being simplified by the use of modern pipe pushing equipment. Its need occurs frequently, where conduit must be installed under paved surfaces.

TOOL INVENTORY — 1.
For Conduit Work

25—small benches and vises
1—hydraulic bender
3—cond. elbow benders
5—Jiffy cutters
9—asst'd pipe cutters
1—No. 4 pipe cutter
10—pipe dies, ¼-in. to ⅜-in.
18—pipe dies, ½-in. to 1½-in.
29—pipe dies, 2-in. to 4-in.
5—½–¾" combination pipe dies
8—1¼" combination pipe dies
5—½" pipe dies
3—00 pipe dies, ⅛-in. to ⅜-in.
4—power drives
5—No. 2 ratchet handles
34—cond. hickeys, ½-in. to 1-in.
14—punches, ½-in. to 1¼-in.
1—reamer
5—bender shoes, 2-in. to 4-in.
3—pipe cutter shoes, 2-in. to 3½-in.
12—No. 1 stocks
4—No. 2 stocks
18—No. 2½ stocks
1—2"–4" die stock
2—comb. stocks
3—#00 ratchet stocks
4—24" chain tongs
5—36" chain tongs
4—large pipe vises
7—24" Stillson wrenches
3—36" Stillson wrenches
1—48" Stillson wrench

Something to Check

On the following pages appear five lists of construction tools and equipment. These were taken from the March 1937 inventory of a well-known contractor in the middle west, who does a volume of around $500,000 in industrial work per year. This inventory of tools has helped a crew of 250 electricians to perform efficiently.

For convenience this entire inventory is reproduced here in five groupings—(1) conduit work, (2) other raceways, (3) wire and cable, (4) special tools needed for one or more types of construction, and (5) tools for line work.

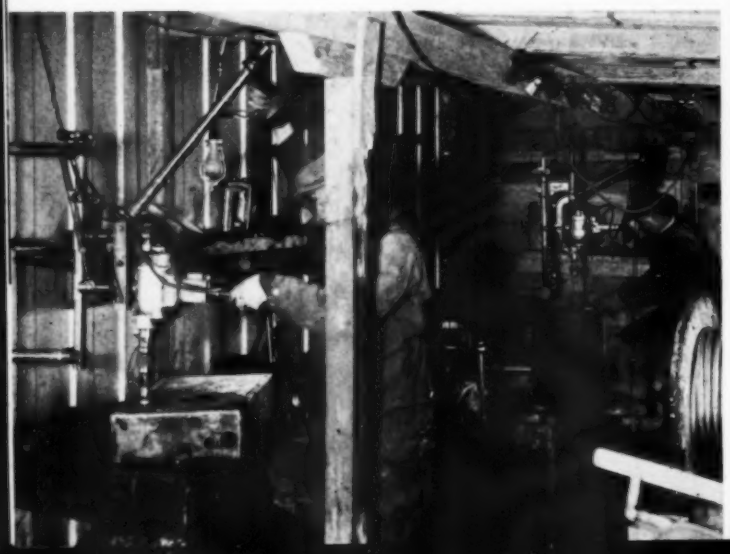
The book value of these tools is not available, but at present market prices, it would cost $7,200 to replace this inventory with new tools.

Tools for Other Raceways

MANY jobs call for a wide variety of wiring methods, so the modern contractor must be tooled for working with electrical metallic tubing, metal and fibre underfloor raceways, fibre or fireproof ducts, wireways, busways, and copper or aluminum bus assemblies of various shapes. To handle such work without the correct tools is not only costly, but results in a poorly finished job. Both are important.

The increased use of electrical metallic tubing has brought out improved benders, vises and accessories with which it is possible to materially increase production. They should be in every contractor's equipment.

Industrial plants and large buildings are making greater use than ever of bus bars. For this work it is necessary to have several important time-saving tools. For example portable power-drive cut-off saws are being used by some contractors. These do away with tedious hand-sawing and the saws are adjustable for use in sawing underfloor raceways and wire-ways. When there is much bus bar to assemble or re-arrange, as in transformer room remodelling, the cost of polishing the bars by hand also runs high. So a power polisher is being used to good advantage. No extensive bus bar job can be handled efficiently, without a good bench-type bender, as well, and several good bench vises for correctly shaping the many small pieces that must be made up.

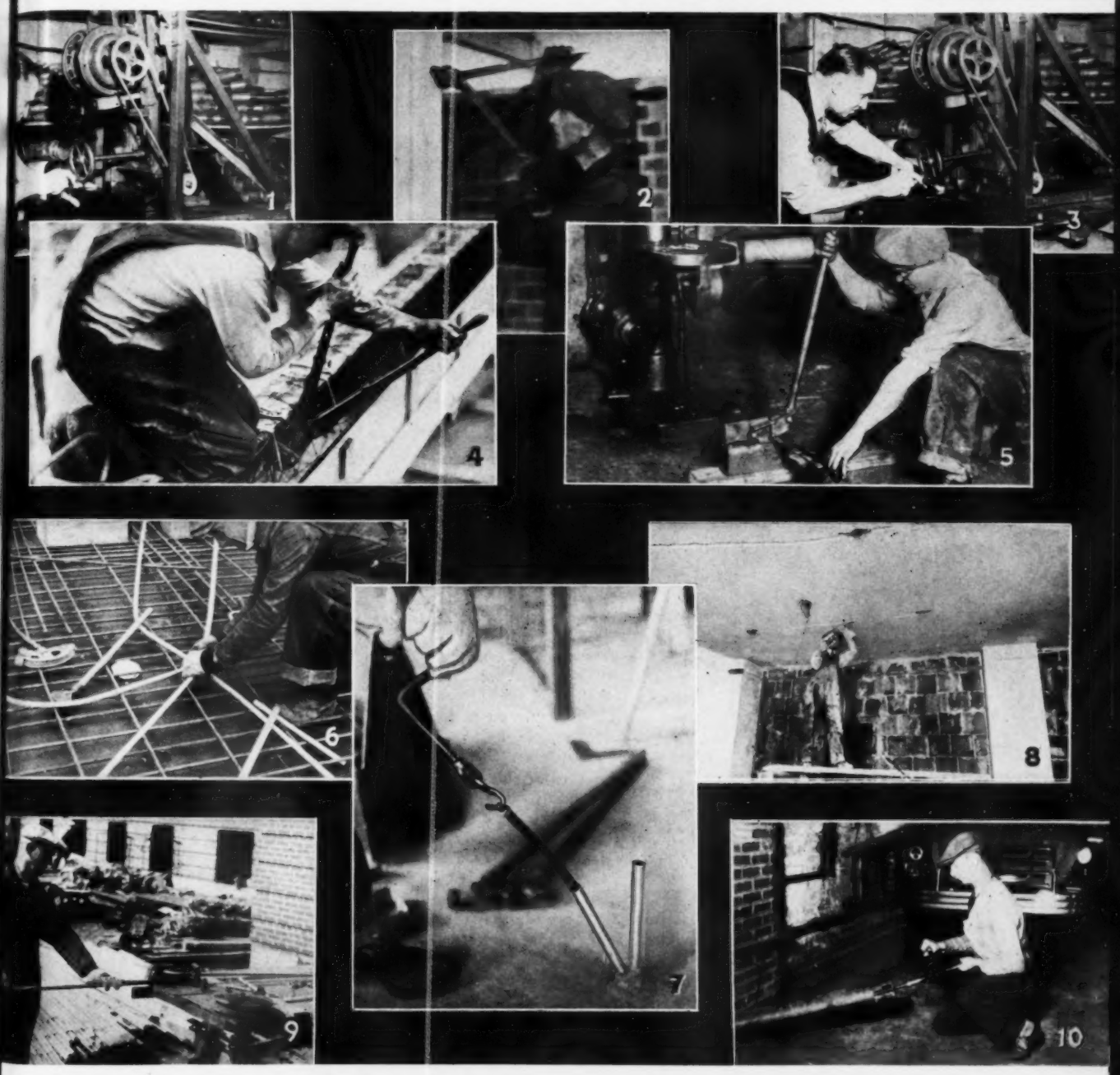


POWER FOR HOLEMAKING — *Heavy-gauge cabinets are brought to the shop bench, where rigid drill frames cut knockouts accurately without expensive hand labor.*

Fibre ducts also need special tools. For trimming there are tapering mandrels which fit a hand brace or electric drill. These save considerable time in fitting up odd lengths of duct in a run.

The cost of making conduit and outlet holes in metal raceways and cabinets can be high or reasonable, depending on the equipment used. So for the lighter gauges and readily accessible equipment, there are saw attachments which may be chucked in an electric drill. For heavy metal, especially at difficult locations, hand-operated hole cutters save time, the defacement of metal, and they save the mechanic's knuckles.

Working the Raceways



TOOLING FOR VARIED SYSTEMS—*1. Metal wireways are quickly sawed off square with this power saw; 2. Strapping to steel makes lightweight sharp punches indispensable; 3. Bus fabrication speeded with power-driven saw; 4. When pliers or hacksaws waste time and knuckles, put bolt cutters on the job; 5. Hefty shears are a help for cutting strap iron; 6. Tubing tools are being made lighter and more adaptable; 7. For making sharp bends in tubing this coil spring insert acts as a crimp-preventing cushion; 8. Tenant changes require good channelling tools; 9. Bench bender for electrical metallic tubing speeds on-the-ground make-ready; 10. Odd pieces of fibre conduit are quickly tapered with this end-cap shaver.*

When You Pull Wire and Cable

FAST completion schedules, so common today, impose various handicaps on cable-pulling crews. With scores of other mechanics rushing around to finish their particular work, the installing of wire and cable, without its being damaged, is often a costly operation.

Although few startling improvements in this type of equipment have developed in recent years, there have been some gradual refinements. One of the recent contributions is a specially-motored winch. Where an 8-man crew had been figured for cable pulling, this tool has been used with one-fourth the pulling cost. Also multiple payout racks for small wire have better guides, are more compact and more portable for working in crowded jobs.

An expensive labor item, that is usually unnoticed, involves the handling of steel fish wires or snakes. Small fish wire come-alongs are available that fit the hand snugly and compress as pulling tension increases. This tool eliminates injuries to fish wire, from the use of pliers, and by lightening the pulling effort, speeds up the job.

TRACTOR PULLING—*Long tunnel feeders pulled with mobile tractor-winch in one back-saving drag.*

HARD PULLS *require safely designed winch controls. Here a 500-ft. run is taken through by tractor power.*

A distinct improvement was recently made when a compact reel, with carrying case, was developed, which keeps the fish wire in place and avoids expensive fussing around in busy corridors. For fishing long runs of rectangular tile duct, one contractor recently attached roller skates along a heavy 500-ft. fish tape, with the wheels spaced at 50 ft.

The problem of snubbing heavy feeders, that are dropped into long vertical runs, requires extreme caution to avoid losing or damaging the conductors. Several practical outfits have been made up for this important operation. This equipment saves considerable make-ready time and avoids costly accidents.

For pulling large lead sheathed multiple conductor cables, a contractor recently had pulling eyes made up at the cable factory attached to each piece of cable. This eliminated a great deal of make-up time on the job and saved many expensive cable ends.

To pull wire with power-driven winches, some contractors have built special adjustable winch racks, to which a threading mule or drive is adapted. In the Lincoln Tunnel, at New York, a special tractor, with an integral winch, was purchased for pulling in heavy cables.

A recent improvement in soldering cable lugs or terminals is an electrically-heated clamp-on plier, operated by a transformer from a 110-volt circuit. This soldering plier is portable and has been found highly satisfactory for heavy work. For jobs where current is not available, the improved acetylene kits and soldering furnaces, of course are indispensable. Marked improvement has been made too, in needle-flame alcohol torches for use in soldering small wires that are close to finished walls or specially plated surfaces or parts. This small flame avoids smudge or flame spillage.

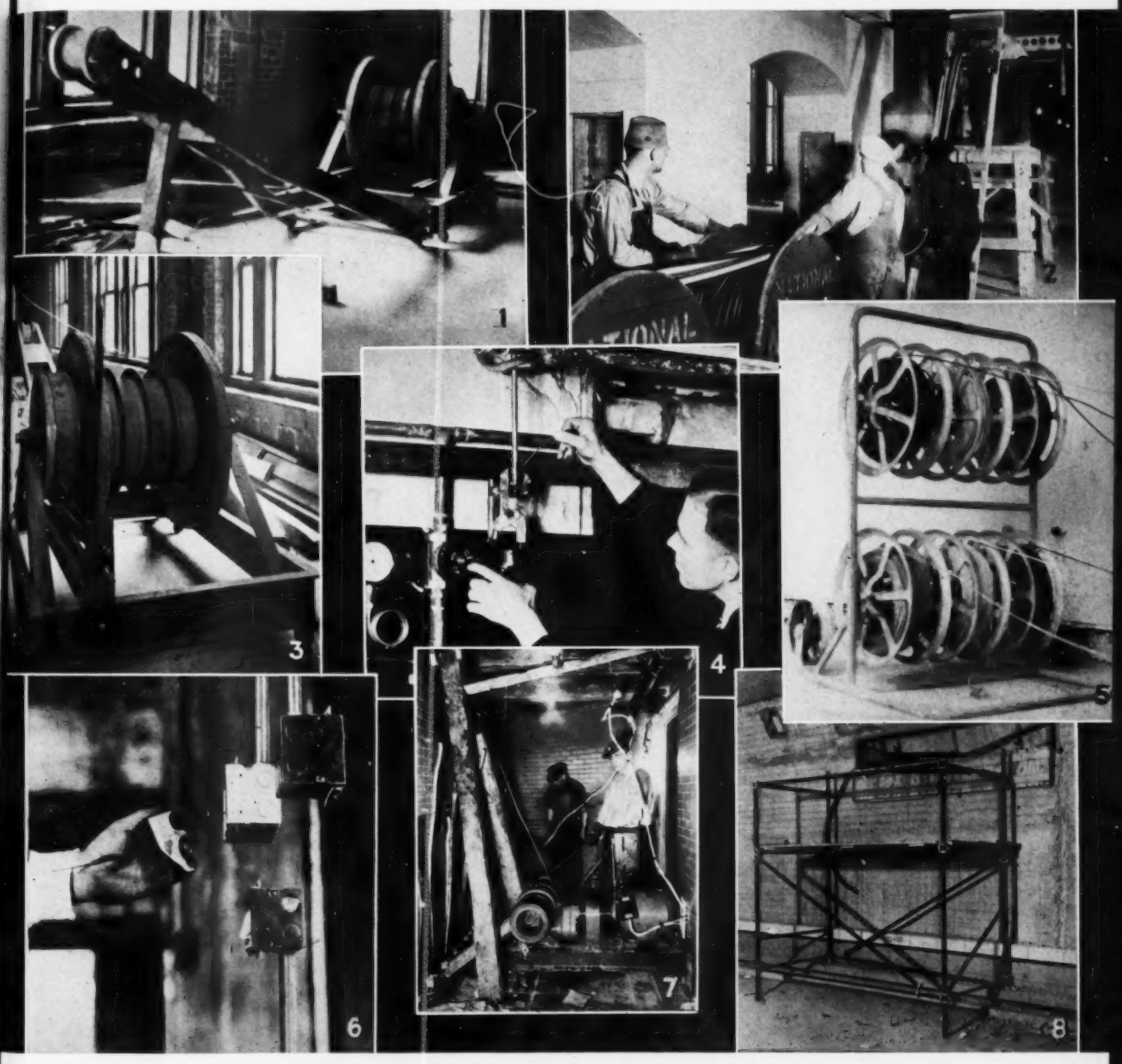
TOOL INVENTORY — 2.
For Other Raceways

5—½" thinwall benders
7—¾" thinwall benders
2—1" thinwall benders
2—busbar benders
5—½" EMT hickeys
7—¾" EMT hickeys
2—1" EMT hickeys
1—Portable busbar and metal raceway saw
1—busbar polisher

TOOL INVENTORY — 3.
For Wire and Cable

1—come-along
6—furnaces
2—cable grips
2—reel jacks
2—small ladles
2—large ladles
2—wire meters
3—large metal pots
1—small metal pot
3—adjustable sets wire reels
11—½" fish tape
11—¼" fish tape
3—wedge-on lug tools
1—cable winch

Handling Conductors



PULLING AND MAKEUP—*1. For heavy vertical cables this snubbing and payout equipment will handle four conductors safely; 2. Big crews cost money if pulling rigs need constant wet nursing; 3. Snubbing drum accommodates three wraps each for four cables, with brake shoe and lever at the side; 4. Electrically-heated soldering pliers now fit the largest of connections; 5. Multiple wire reels must be compact for present-day conditions; 6. Fish wire pulling made safe with finger-grip comealongs; 7. Power winch pulling lead cables solves cramped-quarters problem for a 2-man crew; 8. Up-high pulling and splicing works best from spacious, easily-moved platforms. This one has short legs at one side to fit the job.*

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Tools for Odd Jobs

THERE are many times in a week's work when special power tools repay their cost. Good examples are electric drills and saws, electric, magnetic and pneumatic hammers, air compressors, welding equipment, chain hoists, small tool grinders, special bits and drills for masonry, wood boring machines, metal shears and punches, spring hammers.

(Top) BUS POLISHER—*Motorized abrasive wheel puts shine on rough or dirty copper.*

(Above) BACK SAVER — *Spring tension stand keeps magnetic concrete drill tight at ceiling as holes are drilled from floor.*

(Below) CONCRETE WORM — *Specially tipped rotating bits for electric drills go through concrete and reinforcing bars*

Of course, such tools should be selected of a type useful for a variety of work. Unless the contractor has work requiring enough use of special-made tools to write them off on one job, this rule should be carefully observed.

Electric drills, for instance, should be selected in sizes and speeds most suitable for drilling in wood, metals, bakelite or other composition, as well as for operating hole cutters, or reamers. Special bits, with rotating flat steel tips, can be successfully used in a ⅜-in. heavy-duty electric drill, to bore holes in hard concrete.

Electric or magnetic hammers often reduce hand drilling costs, while on large jobs, cutting, chasing and drilling is sometimes made less expensive with air hammer equipment. Compressed air is often available in larger buildings and it pays to check up the cost of hose extensions and the work involved in moving air drilling equipment from job to job.

For the larger work centers, there are often enough miscellaneous jobs to warrant setting up a shop containing—bench drill press, bench grinder and buffer, heavy metal shears, column type iron benders, power hacksaw and sometimes, a forge and anvil. Frequently such a shop can be so located, that the power pipe threading machine is also most convenient here. Then a combination mechanic-machinist can be kept busy with work, ranging from miscellaneous hanger and rack make-up and pipe cutting and threading, to resharpening drill bits and overhauling.

Among the general-use tools, the selection and care of ladders and extensions, knockdown type rolling scaffolds, swings and chairs, and blocks and tackle, deserve careful consideration. So do bolt cutters, metal punches, bolt dies, stocks and taps, points and drills, levels, transits and testing instruments; measuring tapes; equipment handling dollies, rollers and bars and heavy hammers.

There are many other effort-saving, profit-making tools that pay their way. Progressive electrical contractors should check up on all of them.

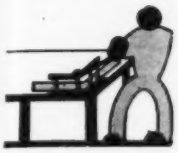
TOOL INVENTORY — 4.
Special Tools

4—Wrecking bars
1—bellows
1—iron bender
6—ass't. wood bits
22—ass't. single, double and triple blocks
1—wood brace
1—boring machine
8—lock and tool boxes
9—casters
22—gas and oil cans
13—chains
36—ass'td. chisels and points
1—ice chopper
10—C clamps, 2-in. to 6-in.
7—Ext. cords
1—bolt cutter
7—¼" to ⅝" bolt dies
2—Elec. drills
5—Elec. drills
13—ass't. star drills
1—Rawlplug drill and holder
32—¼" to ¾" high speed drills
2 fire extinguishers
2—wood bit extensions
8—assorted mill files
2—electric hammers
16—8-lb. to 12-lb. hammers
5—scaffold hooks
1—electric branding iron
26—sections window ladders
28—section extension ladders
31—6-ft. to 14-ft. step ladders
10—lanterns
2—carpenter's levels
1—voltmeter, ac/dc 0-600
2—megohmers
1—ammeter 0/500 a/c
1—0/100 a/c ammeter
1—100/1 instrument transformer
1—air motor
1—old man
12—padlocks
1—plane
1—nail puller
6—metal punches
28—asst'd punches and dies
5—100-ft. ropes, ½-in. to 1-in.
1—angle iron shear
5—tool sheds
1—painter's scaffold
4—circular saws
1—hole saw
1—power saw
1—keyhole saw
3—8" to 14" circular saws (wheels)
1—1000 lb. scale
4—square mault shovels
1—snow shovel
1—bolt die stock
26—¼ to 3/16 hand taps
1—100-ft. steel tape
2—2-wheel trucks
1—4-wheel truck
1—heating transformer
1—transit
3—machinist's vises
1—wheel barrow
7—meter wrenches

TOOL INVENTORY — 5.
For Pole-Line Work

12—pick axes
3—tamping bars
3—digging bars
5—lineman's belts
2—grub hoes
2—draw knives
1—pr. lineman's pliers
9—long-handle shovels
10—extra long-handle shovels
7—spoon shovels
1—pr. lineman's spurs
3—spades

What to Buy and Who Makes It



BENDERS— Rod & Bar

General Device & Fittings Co., *Grand Rapids, Mich.*
Gordon Machinery & Mfg. Co., *Los Angeles, Cal.*
Hinman, D. A., & Co., *Sandwich, Ill.*
Hossfeld Mfg. Co., *Winona, Minn.*
Thoner & Martens, *Boston, Mass.*
Wallace Supplies Mfg. Co., *Chicago, Ill.*

BENDERS— Conduit, Hydraulic & Screw Jack

American Pipe Bending Machine Co., *Boston, Mass.*
Greenlee Tool Co., *Rockford, Ill.*
Hydraulic Press Mfg. Co., The, *Mount Gilead, Ohio*
Lidseen, Gustave, Inc., *Chicago, Ill.*
Newbold & Son Co., R. S., *Norristown, Pa.*
Toledo Pipe Threading Machine Co., *Toledo, Ohio*
U. S. Pipe Bending Co., *San Francisco, Cal.*
Wallace Supplies Mfg. Co., *Chicago, Ill.*
Watson-Stillman Co., The, *Roselle, N. J.*
White City Electric Co., *Chicago, Ill.*

BOLT CUTTERS

Carolus Mfg. Co., *Sterling, Ill.*
Champion DeArment Tool Co., *Meadville, Pa.*
Manco Mfg. Co., *Bradley, Ill.*
Porter, H. K., Inc., *Everett, Mass.*
Roberts Mfg. Co., Inc., *Everett, Mass.*
Sandvik Saw & Tool Corp., *Minneapolis, Minn.*
Whitaker Mfg. Co., The, *Chicago, Ill.*

BORING MACHINES— Joist

Greenlee Tool Co., *Rockford, Ill.*
Henderson Electric Co., *Ampere, N. J.*
Hykon Mfg. Co., The, *Alliance, Ohio*
Ideal Commutator Dresser Co., *Sycamore, Ill.*

This index embraces selected groups of tools that cut cost. The ordinary staple tools, used on every job, are not included. Here then are opportunities for improving your equipment to speed production. Check them over.

CHAIN HOISTS

Bridgeport Chain & Mfg. Co., The, *Bridgeport, Conn.*
Channon, J. H., Corp., *Chicago, Ill.*
Chisholm-Moore Hoist Corp., *Tonawanda, N. Y.*
Ford Chain Block Div. of American Chain & Cable Co., Inc., *York, Pa.*
Round & Son, David, *Cleveland, Ohio*
Speidel Elevator Corp., *Reading, Pa.*
Union Mfg. Co., *New Britain, Conn.*
Wright Mfg. Div. of American Chain & Cable Co., Inc., *York, Pa.*

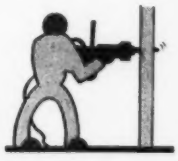
CUTTER— Armored Cable

Atwater Mfg. Co., *Plantsville, Conn.*
Circular Tool Co., *Providence, R. I.*
Mechanical Products Corp., *New York, N. Y.*
Peck, Stow, Wilcox & Moore Drop Forging Co., *Southington, Conn.*
Telkor, Inc., *Elyria, Ohio*
Utica Drop Forge & Tool Corp., *Utica, N. Y.*
Wiss & Sons, Co., Jr., *Newark, N. J.*

CUTTER— Conduit & Tubing

American Pipe Tool Co., *Chicago, Ill.*
Armstrong Mfg. Co., The *Bridgeport, Conn.*
Beaver Pipe Tools, Inc., *Warren, Ohio*
Borden Co., The, *Warren, Ohio*
Erie Tool Works, The, *Erie, Pa.*
Greenfield Tap & Die Corp., *Greenfield, Mass.*
Hollands Mfg. Co., *Erie, Pa.*
International Nutyp Tool Corp., *Oswego, N. Y.*
Nye Tool & Machine Works, *Chicago, Ill.*
Oster-Williams, *Cleveland, Ohio*
Reed Mfg. Co., *Erie, Pa.*
Ridge Tool Co., The, *Elyria, Ohio*
Toledo Pipe Threading Machine Co., The, *Toledo, Ohio*
Trimont Mfg. Co., *Boston, Mass.*
Vanderman Mfg. Co., The, *Willimantic, Conn.*

DRILLS— Portable Electric



Albertson & Co., *Sioux City, Ia.*
Black & Decker Mfg. Co., The, *Towson, Md.*
Chicago Pneumatic Tool Co., *New York, N. Y.*
Cincinnati Electrical Tool Co., *Cincinnati, Ohio*
Clark, Jas., Jr., Electrical Co., Inc., *Louisville, Ky.*
Duffy Mfg. Co., *Chicago, Ill.*
Dumore Co., The, *Racine, Wisc.*
Electric Hammer Corp., *Louisville, Ky.*
Hisey Wolf Machine Co., *Cincinnati, Ohio*
Ideal Commutator Dresser Co., *Sycamore, Ill.*
Independent Pneumatic Tool Co., *Chicago, Ill.*
Jones-Motrola Sales Co., *New York, N. Y.*
Louisville Electric Mfg. Co., *Louisville, Ky.*
Millers Falls Co., *Greenfield, Mass.*
Milwaukee Electric Tool Corp., *Milwaukee, Wisc.*
Misener Mfg. Co., Inc., *Syracuse, N. Y.*
Power King Tool Corp., *Warsaw, Ind.*
Precision Electric Tool & Mfg. Co., *Worcester, Mass.*
Schauer Machine Co., *Cincinnati, Ohio*
Signal Electric Mfg. Co., *Menominee, Mich.*
Skilsaw, Inc., *Chicago, Ill.*
Speedway Mfg. Co., *Cicero, Ill.*
Standard Electrical Tool Co., The, *Cincinnati, Ohio*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*
Stow Mfg. Co., *Binghamton, N. Y.*
Syntron Co., *Pittsburgh, Pa.*
Temco Electric Motor Co., *Leipsic, Ohio*
United States Electrical Tool Co., *Cincinnati, Ohio*
Van Dorn Electric Tool Co., *Towson, Md.*
Wappat, Inc., *Pittsburgh, Pa.*
Wodack Electric Tool Corp., *Chicago, Ill.*

UMI

THE Blade to CUT BX - Wire Mold

MILFORD FLEXIBLE

The Blade with the

EASY-STARTING TEETH

A quick, clean start. No slipping on the cutting line. Teeth will not catch in corners. A smooth finish. Longer Wear.

•

MILFORD FLEXIBLE is a tough tungsten blade with file hard teeth. It will not snap in a frame, and is safe for an electrician to use in cutting over the knee, or in cramped quarters.

•

Ask your jobber for

MILFORD FLEXIBLE

The Blade with the

EASY-STARTING TEETH

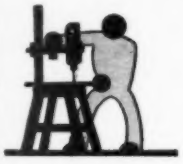
THE HENRY G. THOMPSON & SON CO.

NEW HAVEN, CONN.

Saw Makers for over Half a Century

What to Buy

[FROM PAGE 37]

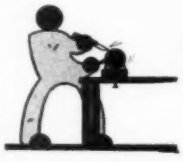


DRILL STANDS

Bay State Tap & Die Co., *Mansfield, Mass.*
Black & Decker Mfg. Co., *Towson, Md.*
Hisey Wolf Machine Co., The, *Cincinnati, Ohio*
Independent Pneumatic Tool Co., *Chicago, Ill.*
Millers Falls Co., *Greenfield, Mass.*
Misener Mfg. Co., Inc., *Syracuse, N. Y.*
Schauer Machinery Co., The, *Cincinnati, Ohio*
Standard Electrical Tool Co., The, *Cincinnati, Ohio*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*
United States Electrical Tool Co., *Cincinnati, Ohio*
Van Dorn Electric Tool Co., *Towson, Md.*
Wappat, Inc., *Pittsburgh, Pa.*
Wodack Electric Tool Corp., *Chicago, Ill.*

FURNACES, SOLDERING

Acme Electric Heating Co., *Boston, Mass.*
Berger Co., L. D., *Philadelphia, Pa.*
Bernz Co., Inc., Otto, *Rochester, N. Y.*
Clayton & Lambert Mfg. Co., *Detroit, Mich.*
Klein & Sons, Mathias, *Chicago, Ill.*
Trent Co., Harold E., *Philadelphia, Pa.*
Turner Brass Works, The, *Sycamore, Ill.*
Unique Mfg. Co., Inc., *Chicago, Ill.*
Yost Mfg. Co., *Meadville, Pa.*



GRINDERS— Bench

Independent Pneumatic Tool Co., *Chicago, Ill.*
Luther Grinder & Tool Co., *Milwaukee, Wisc.*
Matz Specialties, *Reading, Pa.*
Millers Falls Co., *Greenfield, Mass.*
Standard Electrical Tool Co., The, *Cincinnati, Ohio*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*
Syntron Company, *Pittsburgh, Pa.*
Van Dorn Electric Tool Co., *Towson, Md.*

GRIPS— Cable & Wire

Cope, Inc., T. J., *Philadelphia, Pa.*
Crescent Tool Co., *Jamestown, N. Y.*
Farnham & Cunningham, *Los Angeles, Cal.*

E-Z WIRE STRIPPER

. . . . . SAFE

. . . ECONOMICAL

Strips insulation 20 times faster

The E-Z Stripper is always ready—protects wire and hands—saves time and money. Will strip wire many times faster than by ordinary methods. Simple to use—with a squeeze of handles it CLAMPS—CUTS insulation and STRIPS instantly and automatically.

Thousands in use the world over. Specified by U. S. Navy, General Electric, Westinghouse, General Cable, Otis Elevator, and all leading railroads.

Four sizes: No. 0—20 to 30; No. 1—12 to 18; No. 2—10 to 16; No. 3—8 to 14.

Also manufacturers of the Colonial Rotary Stripper, E-Z Foot Pedal Bench Strippers and E-Z Soldering Cups.

PYRAMID PRODUCTS CO.

2309 S. State St., CHICAGO, ILL.

WHICH?

30 Minutes by Hand—*or*

3 Minutes with a

SYNTRON

"MOTORLESS"

ELECTRIC HAMMER

For

Drilling Holes in Concrete
Cutting Channels for Conduit
and
A Dozen Other Time Saving Jobs

Write for new 1937 Catalogue

SYNTRON CO.

BOX "A", HOMER CITY, PA.

Better TOOLS *make*

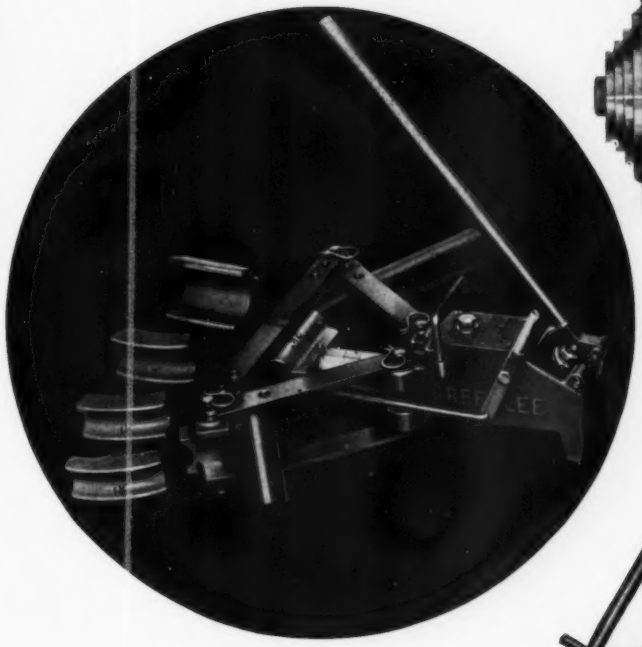
BETTER WIRING JOBS

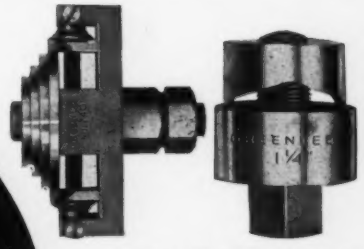
and greater profits

Greenlee Boring Tools

For boring holes at high speed, use the No. 31 Electricians' Bit, which is known as the fastest boring tool on the market. It has a double-spur head for long life and a coarse screw point for fast feed. Other popular types of bits for the electrician are also included in the Greenlee line.

When an extra long reach is needed, a Greenlee Bit Extension is the ideal tool. The No. 900 will drive bits up to 1-inch diameter and is small enough to follow a ⅜-inch tool. A positive lock always prevents the bit from coming loose and being lost in the work. Made in a variety of lengths, and a larger size for bits up to 2-in is also available.





Greenlee Knockout Tools

These tools enlarge holes in outlet boxes, switch cabinets, etc., quickly and accurately, without filing or reaming. No. 735 Punch Set is for ½, ¾, 1 and 1¼-inch conduit, while the No. 737 Set is for 1½ and 2-inch conduit. No. 740 Cutter will enlarge holes for 1½, 2, 2½ and 3-inch conduit.

Greenlee Hydraulic Pipe Pusher

The No. 790 Pusher saves much time and labor. Easy for one man to operate. Has capacity for 4-inch and smaller pipe and will exert a maximum pressure of 40,000 pounds on the pipe clamp.

Rigid Conduit Benders

Above is the Greenlee No. 770 Hydraulic Bender for rigid conduit. By pumping the handle, a shoe on the ram is forced against the conduit, which is held at two points by formed support castings. It makes smooth, even bends faster and easier than by any other method. It is simple to operate and easy to take to the job. No. 770 bends all sizes of conduit from 1¼ to 3-inch. The larger bender, No. 775, handles all sizes from 2½ to 4½-inch.

Thin-Wall Steel Conduit Bender

The Greenlee No. 770-T Hydraulic Bender is the solution to the problem of how to bend thin-wall conduit quickly and without crushing. Same power unit as No. 770, but with different attachments. Will handle 1¼, 1½ and 2-inch sizes.

On every job where conduit is to be bent, knockouts enlarged, holes bored, or pipe pushed through the ground, Greenlee Tools can be used to advantage. The reason is that they save money by doing the jobs faster, better, and with less effort for the workman.

Take the Greenlee Hydraulic Conduit Bender as an example. Here is a tool that not only makes bends faster and easier, but it makes better bends, eliminates the need for many manufactured fittings, and makes it easier to pull in wire and cable. So satisfactorily have these tools performed that a number of contractors have written us that their bender paid for itself on the very first job.

This can easily be true of the other tools shown here and of the Greenlee Ball-Bearing Joist Borer, which is not illustrated. Each one is a time saver and worth investigating. Complete details will be sent with no obligation to you.

Mail this coupon today

GREENLEE TOOL CO., ROCKFORD, ILL.
Please send information on the following tools:

☐ Rigid Conduit Benders ☐ Thin-Wall Conduit Benders ☐ Pipe Pushers
☐ Knockout Tools ☐ Joist Borers ☐ Electricians' Bits ☐ Bit Extensions

Name..... Address.....

City..... State.....

My Jobber is.....

GREENLEE TOOL CO. ROCKFORD, ILL.

UMI

BETTER PLIERS

Pliers better than Kleins cannot be made. Necessarily the careful hand craftsman methods of manufacture, the individual testing and inspection that produces the finest pliers is more expensive than modern methods of mass production. In the electrical field safety demands the highest in quality. There is no way to achieve Klein quality save by Klein methods.

Klein's Side Cutting Plier

No. 201

The famous Klein Plier, popular with linemen and electricians. Drop forged from alloy tool steel.

Cat. No.	Size	Weight Per Doz.
201-5	5-inch	3 lbs.
201-6	6-inch	5 lbs.
201-7	7-inch	7½ lbs.
201-8	8-inch	12 lbs.
201-9	9-inch	12½ lbs.

Klein's Long Nose Plier

No. 301

A well-balanced strong tool especially designed for getting into difficult places. Point ⅛ in. round.

Cat. No.	Size	Weight Per Doz.
301-5	5-inch (Plain)	2¾ lbs.
301-6	6-inch (Plain)	3 lbs.
203-5	5-inch (Cutting Knives).	2¾ lbs.
203-6	6-inch (Cutting Knives).	3 lbs.

Klein's Oblique Cutting Plier

No. 202

Cuts close, the narrow head permitting its use in confined places.

Cat. No.	Size	Weight Per Doz.
202-5	5-inch	4 lbs.
202-6	6-inch	4¼ lbs.
242-6	6-inch (Heavy duty type)	4¾ lbs.

Klein's "Chicago" Fish-Tape Puller

Patent No. 1,628,744

Klein's "Chicago" Fish-Tape Puller grips like a vise—never slips—simple, strong automatic. Does not injure the tape. 3¾ inches long. Can be carried in pocket. Saves time and protects the hand.

Cat. No.	Weight Per Doz.
1629 For Standard Fish Tapes..	2½ lbs.
1629-A Modified for No. 12 Iron Wire	2½ lbs.

Mathias KLEIN & Sons Established 1857 Chicago, Ill. U.S.A.

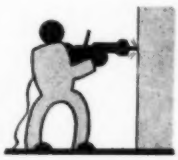
3200 Belmont Avenue Chicago

What to Buy

[FROM PAGE 38]

Hercules Mfg. Co., *Cambria, Va.*
Kellems Products, Inc., *New York, N. Y.*
Klein & Sons, Mathias, *Chicago, Ill.*
Page Engineering Co., *Syracuse, N. Y.*
Peck, Stow, Wilcox & Moore Drop Forging Co., *Southington, Conn.*
Reliable Electric Co., *Chicago, Ill.*
Tips Tool Co., Inc., *Taylorville, Ill.*

HAMMERS— Portable Electric—



Black & Decker Mfg. Co., The, *Towson, Md.*
Chicago Pneumatic Tool Co., *New York, N. Y.*
Electric Hammer Corp., *Louisville, Ky.*
Independent Pneumatic Tool Corp., *Chicago, Ill.*
Millers Falls Co., *Greenfield, Mass.*
Milwaukee Electric Tool Corp., *Milwaukee, Wis.*
Ohio Electric Hammer Co., *Cincinnati, Ohio*
Phillips Drill Co., *Chicago, Ill.*
Speedway Mfg. Co., *Cicero, Ill.*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*
Syntron Co., *Pittsburgh, Pa.*
United States Electrical Tool Co., *Cincinnati, Ohio*
Van Dorn Electric Tool Co., The, *Towson, Md.*
Wodack Electric Tool Corp., *Chicago, Ill.*

PIPE TONGS & WRENCHES

Armstrong Bros. Tool Co., *Chicago, Ill.*
Bernz, Otto, Co., *Rochester, N. Y.*
Billings & Spencer Co., The, *Hartford, Conn.*
Erie Tool Works, The, *Erie, Pa.*
Greenfield Tap & Die Corp., *Greenfield, Mass.*
International Nutyp Tool Corp., *Oswego, N. Y.*
Jarecki Mfg. Co., *Erie, Pa.*
Peck, Stow, Wilcox & Moore Drop Forging Co., *Southington, Conn.*
Ridge Tool Co., The, *Elyria, Ohio*
Trimont Mfg. Co., *Roxbury, Boston, Mass.*
Walworth Co., Inc., *New York, N. Y.*
Williams & Co., J. H., *Buffalo, N. Y.*

PUNCHES—

Knockout

Albertson & Co., *Sioux City, Ia.*
Black & Decker Mfg. Co., The, *Towson, Md.*

DON'T

be handicapped with worn out obsolete tools

MODERN TOOLS do a better job in less time

READ

ELECTRICAL CONTRACTING every month for the latest and best information on QUALITY TOOLS and their applications

Electrical Contracting, 330 W. 42, New York

Greenlee Tool Co., *Rockford, Ill.*
Hykon Mfg. Co., The, *Alliance, Ohio*
Koch & Co., Paul W., *Chicago, Ill.*
Nischan Draw Punch Co., *Hammond, Ind.*
Peck, Stow, Wilcox & Moore Drop Forging Co., *Springfield, Mass.*
Van Dorn Electric Tool Co., *Towson, Md.*

Metal

American Swiss File & Tool Co., *Elizabeth, N. J.*
Millers Falls Co., *Greenfield, Mass.*
Niagara Machine & Tool Works, *Buffalo, N. Y.*
Peck, Stow, Wilcox & Moore Drop Forging Co., *Southington, Conn.*
Snell Mfg. Co., *Fiskdale, Mass.*
Whitney Metal Tool Co., *Rockford, Ill.*

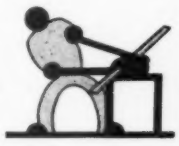
REELS— Portable Wire—

American Fork & Hoe Co., The, *Cleveland, Ohio*
Dicke Tool Co., The, *Downers Grove, Ill.*
Hykon Mfg. Co., The, *Alliance, Ohio*
Leach Co., *Oshkosh, Wis.*
Matthews Corp., W. N., *St. Louis, Mo.*
Minneapolis Electric & Construction Co., *Minneapolis, Minn.*
Smith-Robinson Mfg. Co., *Portland, Ore.*
Utility Supply Co., *Clintonville, Wis.*
Waldman, John J., *New York, N. Y.*

SAWS— Portable Electric Hole

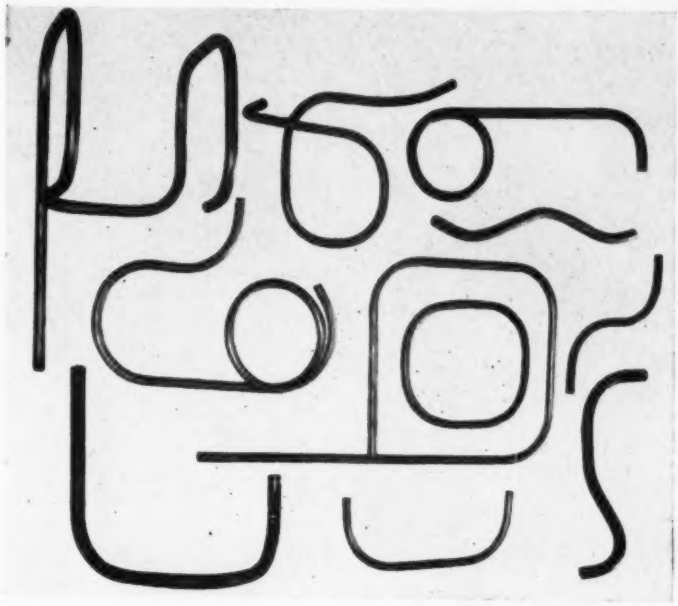
Black & Decker Mfg. Co., The, *Towson, Md.*
Casey Mfg. Co., *Oshkosh, Wisc.*
Cocker Saw Co., Inc., *Lockport, N. Y.*
Ephrata Mfg. Co., *Ephrata, Pa.*
Hall & Brown Wood Working Machine Co., *St. Louis, Mo.*
Kennedy, Ralph M., *Philadelphia, Pa.*
Millers Falls Co., *Greenfield, Mass.*
Misener Mfg. Co., Inc., *Syracuse, N. Y.*
Porter-Cable Machine Co., *Syracuse, N. Y.*
Power King Tool Corp., *Warsaw, Ind.*
Ruleta Co., *New York, N. Y.*
Scully Steel Products Co., *Chicago, Ill.*
Skilsaw, Inc., *Chicago, Ill.*
Speedway Mfg. Co., *Cicero, Ill.*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*
Syntron Company, *Pittsburgh, Pa.*
Van Dorn Electric Tool Co., The, *Townson, Md.*
York Saw Works, *York, Pa.*

SHEARS— Bar, Hand

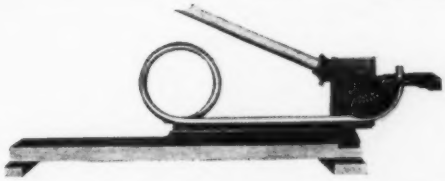


Champion Blower & Forge Co., *Lancaster, Pa.*
Champion Shear Co., The W. H., *Newark, N. J.*

BENDS LIKE THESE



HOW TO CUT
COSTS
with the
Type HB



ELPECO TUBE and CONDUIT BENDER

Saving money on jobs is the best way to make contractors talk. So high praise from contractors, wiremen, plumbers and mechanics has been accorded this scientific development of a simple portable bending tool.

Here's how it saves money on the job:

Perfect bends of pipe conduit or tubing are quickly made WITH NO FLATS OR KINKS. And this type of bend can be made in the average time of 7 or 8 seconds.

The design embodies the highly desirable element of portability and reasonable weight.

Further, it is quickly adjustable to accommodate various sizes and types of tube or conduit.

Complete details of the bender together with instructions for handling will interest you and your men. These are contained in the new Elpeco Bulletin No. 111. Write for copy. The coupon is for your convenience.

ELECTRIC POWER EQUIPMENT CORP.
412 N. 18th St., Philadelphia, Pa.
Please send by return mail to the address below complete bulletin on the HB bender . . . together with prices.

Name .....
Address .....

UMI

Prest-O-Lite Trade-Mark TORCHES AND SOLDERING IRONS... *ideal for electrical work*

● *Prest-O-Lite* Torches and Soldering Irons are available in convenient and moderately priced outfits, covering every open-flame or enclosed-flame requirement of the electrical contractor. These appliances are economical equipment for soldering, heating and brazing.

Prest-O-Lite appliances operate on *Prest-O-Lite* Gas, which can be obtained conveniently in small tanks at any of the thousands of *Prest-O-Lite* Gas Exchange Service Stations. You exchange your empty tank for a full one and pay for the gas only.

Your jobber will gladly demonstrate the many features of *Prest-O-Lite* equipment. Call him, or write the Linde office near you.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
New York and Principal Cities
In Canada:
Dominion Oxygen Company, Limited, Toronto

What to Buy

[FROM PAGE 41]

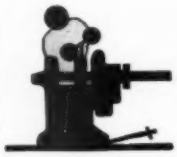
Gordon Machinery & Mfg. Co., *Los Angeles, Cal.*
Hendley & Whittemore Co., *Beloit, Wis.*
Niagara Machine & Tool Works, *Buffalo, N. Y.*
Watson-Stillman Co., The, *Roselle, N. J.*
Whitney Metal Tool Co., *Rockford, Ill.*

SHEARS— Electric Power

Hendley & Whittemore Co., *Beloit, Wis.*
Quick Work Co., The, *St. Marys, Ohio*
Stanley Electric Tool Div., The Stanley Works, *New Britain, Conn.*

STOCKS AND DIES

Armstrong Bros. Tool Co., *Chicago, Ill.*
Armstrong Mfg. Co., *Bridgeport, Conn.*
Beaver Pipe Tools, *Warren, Ohio*
Erie Tool Works, *Erie, Pa.*
Hollands Mfg. Co., *Erie, Pa.*
Nye Tool & Machine Works, *Chicago, Ill.*
Oster-Williams, *Cleveland, Ohio*
Reed Mfg. Co., *Erie, Pa.*
Ridge Tool Co., *Elyria, Ohio*
Standard Tool Co., *Cleveland, Ohio*
Toledo Pipe Threading Machine Co., *Toledo, Ohio*
Walworth Co., *New York, N. Y.*



THREADING MACHINES— Pipe

Axelson Mfg. Co., Ltd., *Los Angeles, Cal.*
Armstrong Mfg. Co., The, *Bridgeport, Conn.*
Beaver Pipe Tools, Inc., *Warren, Ohio*
Bignall & Keeler Machine Works, *Edwardsville, Ill.*
Bordon Co., The, *Warren, Ohio*
Boynton & Plummer, Inc., *Chester Depot, Vt.*
Greenfield Tap & Die Corp., *Greenfield, Md.*
Jarecki Mfg. Co., *Erie, Pa.*
Landis Machine Co., *Waynesboro, Pa.*
Merrill Mfg. Co., The, *Toledo, Ohio*
Oster-Williams, *Cleveland, Ohio*
Toledo Pipe Threading Machine Co., The, *Toledo, Ohio*

TORCHES— Soldering, Cutting, Welding,

Air Reduction Sales Co., *New York, N. Y.*
Bastian-Blessing Co., The, *Chicago, Ill.*

To Bend, Unbend, or Straighten Conduit

USE

Henderson Hickeys & Conduit Benders

More Strength *SHELL TYPE* Less Weight
Henderson E Z for rigid conduit
Six sizes: ½, ¾, 1, 1¼, 1½ and 2"

•

Henderson Tubenders

for thin wall conduit
Four sizes: ½, ¾, 1 and 1¼"

•

Henderson Patent Joist Boring Machine

Makers of electrician's tools for over forty years

WHY NOT BUY THE BEST
See Your Jobber

Henderson Electric Co.
Established 1893
AMPERE NEW JERSEY

MARTIN
Portable
VISE STAND and PIPE BENDER

Sets up in a half minute and *stands without hitching*

Here is a genuine time-saver for cutting or threading conduit up to 2½". Bending capacity ¾". Carry the Martin Vise Stand and Pipe Bender on the job — it's *really* portable. Write for complete details and prices.

H. P. MARTIN & SONS
800 W. 12th St., Owensboro, Ky.

On Drives

[FROM PAGE 42]

Imperial Brass Mfg. Co., The, *Chicago, Ill.*
Linde Air Products Co., *New York, N. Y.*
Milburn Co., Alexander, *Baltimore, Md.*
Scully Steel Products Corp., *Chicago, Ill.*
Sight Feed Generator Co., *Richmond, Ind.*
Smith Welding Equipment Corp., *Minneapolis, Minn.*
Super Oxy-Acetylene Mfg. Co., *Hamilton, Ohio*
Tolman Mfg. Co., *Boston, Mass.*
Torchweld Equipment Co., *Chicago, Ill.*
Union Carbide & Carbon Corp., *New York, N. Y.*
Victor Equipment Co., *San Francisco, Cal.*

WINCHES

Bridgeport Chain & Mfg. Co., The, *Bridgeport, Conn.*
Dobbie Foundry & Machine Co., *Niagara Falls, N. Y.*
Erie Hoist Co., The, *Erie, Pa.*
Indiana Foundry Co., *Indiana, Pa.*
Krein Chain Co., The, *Wapakoneta, Ohio*
Round & Son, David, *Cleveland, Ohio*
Shultz & Son, A. L., *Chicago, Ill.*
Silent Hoist Winch & Chain Co., *Brooklyn, N. Y.*
Stimmel Winch Co., *Long Island City, N. Y.*

WIRE MEASURING MACHINES

Artos Engineering Co., *Milwaukee, Wis.*
Durant Mfg. Co., *Milwaukee, Wis.*
Minneapolis Electric & Construction Co., *Minneapolis, Minn.*
New England Butt Co., *Providence, R. I.*
Textile Machine Works, *Reading, Pa.*
Viking Tool & Machine Co., The, *Belleville, N. J.*
Waldman, John J., *New York, N. Y.*
Watson Machine Co., The, *Paterson, N. J.*

WIRE STRIPPER

Dicke Tool Co., The, *Downers Grove, Ill.*
Grinder Sales Co., *Detroit, Mich.*
Ideal Commutator Dresser Co., *Sycamore, Ill.*
Klein & Sons, Mathias, *Chicago, Ill.*
Klopp Engineering, *Detroit, Mich.*
Novelty Electric Co., *Philadelphia, Pa.*
Pyramid Products Co., *Chicago, Ill.*

MISCELLANEOUS

Fish Tape Reel

Ideal Commutator Dresser Co., *Sycamore, Ill.*

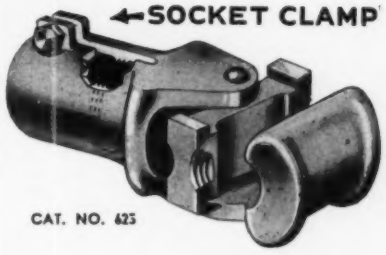
Pushers—Pipe Underground

Giant Mfg. Co., *Council Bluffs, Ia.*
Greenlee Tool Co.,
Williams & Son, H. C.,

Soldering Pliers—Electric

Ideal Commutator Dresser Co., *Sycamore, Ill.*

2 in 1 CONDUIT BENDER



CAT. NO. 625

Reversible jaw fits both ½" and ¾" conduit

Designed with deep socket for 1" pipe handle. Socket is threaded internally and eliminates necessity for pipe coupling.

The SOCKET CLAMP feature avoids any possibility of handle coming loose or breaking off—the only real improvement in conduit bender design in many years.

Latrobe benders will not slip or kink the pipe when making usual bends. Made of "TUF-A-LOY" Steel, and guaranteed against breakage.

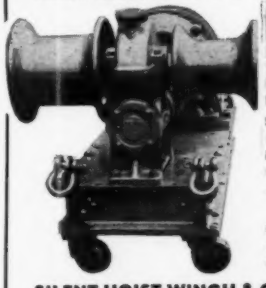
Standard package of 15.....$2.50 each
Less than standard package.... 3.00 each

KEYSTONE FISH WIRE

Specify Keystone for safety and strength. Just the right amount of stiffness and "springiness." Ten sizes for all applications.

FULLMAN MFG. CO.
Latrobe, Pennsylvania

CUT CABLE-PULLING MAN-HOURS . . . . . .



With a **Silent Hoist** Motor Driven Worm Geared Portable Power Winch

Save Time, Make Money on the Heavy Pulling Jobs

Information and Price on Request

SILENT HOIST WINCH & CRANE CO.
769 HENRY ST. BROOKLYN, N. Y.

WODACK "DO - ALL" Electric Hammer and Drill Combined

The most useful and profitable tool for electrical installation and maintenance work. Used by leading contractors and Industries. 2 models—drilling capacity in concrete to 1⅝", in metal ⅝", in wood ⅝". Universal motor—full ball-bearing—indispensable to users of expansion bolts and screw anchors. Cuts drilling costs—reduces maintenance expense. Ask for bulletin.

WODACK ELECTRIC TOOL CORPORATION
4628 W. Huron Street Chicago, Ill.

Don't miss these editorial features in July ELECTRICAL CONTRACTING:

- ELECTRICAL FEATURES *of the New* MELLON INSTITUTE *Feature Section*
- EXPLOSION-PROOF WIRING

BARTLETT
COMPOUND LEVER
SNIPS
Cuts installation costs

Not necessary to open blade to full span, due to design of compounding lever action giving evenly distributed cutting strain. Available in five sizes. Made of Drop Forged high grade Tool Steel. Fully Guaranteed.

Bench Shears
Bench and portable types. Handy, time saving tools for accurate clean work on heavy metal, capacity 12 gauge.
Also Insulated Tree Trimmers

BARTLETT MANUFACTURING CO.
3065 E. Grand Blvd., Detroit, Mich.

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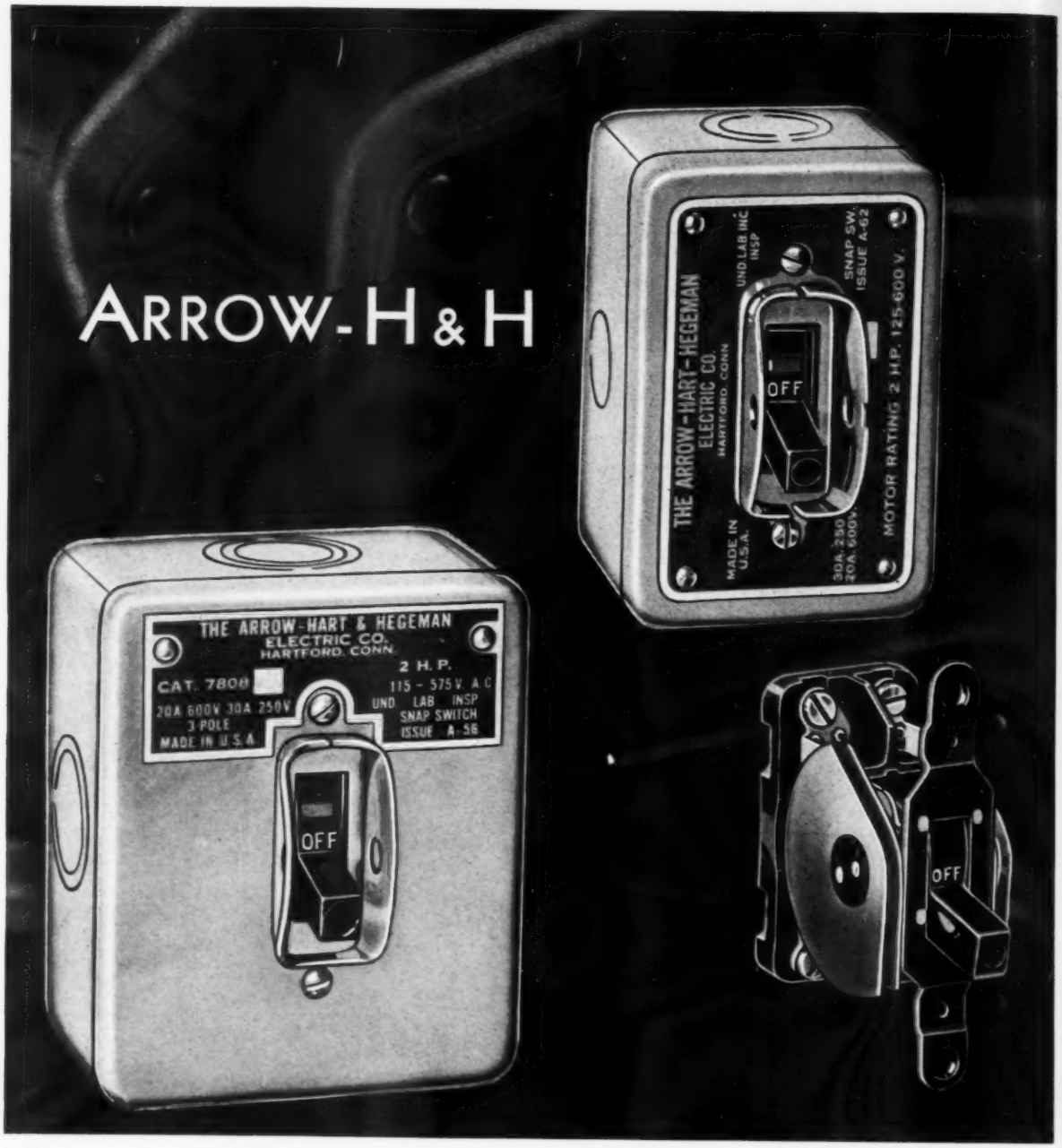


Small Motor Starting Switches

Across-the-Line Type Tumbler Switches, without overload protection. . . Give positive control for motors; especially suitable for oil burners, refrigerators, motor-driven machinery and lighting loads.

These switches have rugged, durable mechanisms built to perform with the sturdy integrity characteristic of Arrow-H & H Lines. Bakelite arc snuffers increase breaking capacity; kick-off release mechanically starts the switch blades in motion and prevents sticking; extra-heavy blades and contact jaws increase current-carrying capacity.

Different styles of mounting are supplied for a wide range of machine-design requirements. Separate switch units are available for installations in switch housings built into motor-driven machinery.

No. 6808 (upper right) is a double-pole switch for single phase motors; No. 7808 (lower left) is 3-pole for 3-phase jobs. Also, the line includes 3-way, 4-pole and 2-speed reversing switches. All have horsepower ratings. . . Everything you may need in this line will be found in Motor Starting Switch Catalog No. 7 — on request.

SOLD THROUGH YOUR ELECTRICAL WHOLESALER

HART & HEGEMAN DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

By J. R. Woodhull
Jordan Electric Company
Topeka, Kansas

Little Matters of Common Sense

We're Selling Our Customers Safety— We're Making More Out of Our Time.

TOO long, we electrical contractor-dealers have been shy about stressing the risk of cheap electrical materials and accessories. We have been afraid they would think we had an axe to grind; that we were trying to put the dime stores out of business, by fighting brass sockets in the basement, and unidentified, buried hot wires. Too long, also, we have been forgetting our own interests and it has lost us much profit. But we've made a little private declaration of independence here, and from now on we are getting the customer just as educated as we can, as to her interests and our own. Here are a few random examples of what I mean—

1. Part of our program is to stress buying lighting fixtures locally, so as to have the privilege of local service, from a local house with 35 years experience. We carry a $4000 constant inventory in fixtures, 60 per cent of which turns six times annually. We retire styles and add new ones, every month of the year. We sell as many jobs without wiring as we do complete jobs. But once another contractor is the successful contender for the job, we never follow it further. If the customer wants to come in and select from our complete line, we are glad to "sell it in Topeka," but we don't chisel in.

2. Twenty-five years ago, I started charging architects full price for all service work in their own homes. They had expected us to sweeten this because they could "do us some good." Frankly, there was nothing they could do for me, unless I was low man, and they knew it. We like their business, surely; but don't bait it with free jobs.

3. When customers come to us with the good old one about getting it cheaper elsewhere, I say, "Go ahead. That's fine. I don't know anything about the quality you're getting; and 33⅓ is a fine discount, if you can get it. But; of course, we just can't do that. We use a No. 6 feed wire in range installations, where some use a No. 8. We insist on porcelain sockets for bath and basement. We identify all ground wires. We refuse to put 15-amp. fuses in residences, because it isn't code. But go ahead, if you feel safe with cheap materials and trick discounts. I'm for you." Usually that calls for a reconsideration. And usually we gain.

4. We enclose a bundle insert in each package about electric iron cords and are steadily educating our customers. When they come in for a new cord for an iron, we ask them to let us check their posts—or to have them checked elsewhere. And 98 per cent of the time, the contact points are pitted and burned. Arcing back and forth will cause them to burn out, and the customer is unaware of this.

We work this plan in reverse, too. When the posts are needing renewing, we recommend a good cord, explaining that the few strands of heavy wire in cheap cords are poorer conductors than the current-carrier with many fine strands. That is a great surprise to all women, and some men. If they have had a lot of trouble, they are ready for conversion, and don't mind the double sale of new points (85c) and a good cord (60c).

5. Because my days are filled to overflowing with contacts, selling, and supervision, I do my studying at night. Magazines, newspapers, manufacturers' pamphlets, all go home with me. Then Mrs. Woodhull and I study them. We pore over the ads. Clippings, devoted to contractor's work, are classified.

Your Electric Iron Cord

You may have an iron cord set that will last you four or more years. All you need to do is to observe a few simple rules.

FIRST—Buy a cord set with a HEAT RESISTING iron plug that fits your iron posts perfectly.

SECOND—Be sure that the cord in your set is at least 20,000 cycle which means a cord composed of a lot of small flexible strands instead of one of a small number of large stiff strands. And furthermore be sure that it is large enough to carry the current without heating. Your iron carries from 660 to 1000 watts you know.

THIRD—Have a rubber or other non-breakable attachment plug on the other end of your cord that fits the wall socket correctly and has a good grip that eliminates the necessity of pulling on cord to disconnect it from the wall socket. And last, but not least BE SURE THAT THE POSTS of your iron are clean, not pitted, corroded or insulated with carbon as perfect contact between cord set and iron is essential to get the full benefit of the current you are buying. Poor contact destroys the plug and wastes electricity.

Buying cheap iron cords is not only very poor economy, but actually dangerous as you are dealing with heavy current consumption when you use electric heat. Electricity is the most efficient and economical servant we have, but should be used intelligently.

JORDAN ELECTRIC CO.
118 West Eighth St.
Topeka, Kansas

CUSTOMER EDUCATION—*This bit of counsel is wrapped into every package*

Every morning this handy steel file is brought up to date. I can turn to my folders and use the materials I have saved. I never have to think, "Where the heck did I read something on that subject?" When I need labor estimates, I have them. When I want the authority for some statement, I can put my finger on it. This plan is saving me time, as well as wear on the mind.

These are just little matters of common sense but we had been overlooking them. So do many other contractors. We are now trying to make more money by plain talk and fair dealing, and we find it pays.

UMI

Anaconda Wire & Cable

General Offices: 25 BROADWAY, NEW YORK • Chicago Office: 20 NORTH WACKER DRIVE

HAVE YOU SENT FOR YOUR COPIES OF THE BOOKS SHOWN BELOW?

Are your Electrical Circuits

MODERNIZED WIRING AIDS PLANT OPERATION IN THESE 6 WAYS

1 Prevents breakdowns that retard production and cause labor to lose wages.
2 Prevents light losses and slowing down of machines due to voltage drop.
3 Prevents dissipation of power in the form of unyieldy heat losses.
4 Lowers maintenance and repair costs
5 Permits shifting of equipment or installation of new machinery with minimum delay.
6 Protects safety of workers and lowers insurance rates—a permanent saving!

Anaconda Wire & Cable Company

General Offices: 25 Broadway, New York

Chicago Office: 20 North Wacker Drive

"1911 MODEL"?

Antiquated electrical circuits, like old cars, often fail under the strain of high-speed, long runs

TODAY in many lines . . . yours, perhaps . . . plants are busy turning out products of smart new design. Production schedules have been stepped up to keep pace with the rush of orders. Yet the electric circuits upon which successful operation depends have not been changed. They are grotesquely out of date!

When business was slow, antiquated circuits were less vital. But now that manufacturing is speeded up, breakdowns are frequent. A feeder blows. All along the line, production is paralyzed. Thousands of dollars are lost because management failed to modernize wiring.

Estimates show that 9 out of 10 industrial plants are handicapped by old-fashioned, deficient electric circuits. Even when actual breakdowns do not occur, dollars are flying out of the window needlessly. Power is being dissipated in the form of heat losses. Machines are slowed down by voltage drop. Maintenance and repair costs are higher than they should be.

How about your plant? Safeguard it against these dangers. Have a check-up of electric circuits made! It will cost you nothing and may save many dollars.

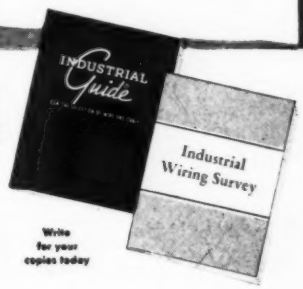
Two important books you should have

To aid you in avoiding breakdowns . . . to enable you to stop hidden losses . . . we have prepared two useful books. One is our *"Industrial Wiring Survey"*. This volume tells you how to initiate a check-up of electric circuits.

The other is our *"Industrial Guide for the Selection of Wire and Cable"*. Brand new, it is the only thing of its kind in the electrical industry. Scores of situations are listed together with the correct wiring solution of each.

SEND FOR THESE BOOKS—

then put the matter of modernizing up to your electrical engineer, consultant, or electrical contractor. If you have a specific problem, consult our engineering department. We will cooperate without obligation.



Write for your copies today

Anaconda Wire & Cable Company

Sales Offices in Principal Cities

THROUGH ads like the one shown here, we are saying "Modernize wiring" to industrial plant managers the country over. Tie up with this campaign! Use the books in your selling. The "Industrial Wiring Survey" answers the plant manager's question "How can I find out what's wrong?" The "Industrial Guide" answers his next query "How can I correct the condition?" Both books will be sent you free. Write for them today. The coupon is for your convenience.

ANACONDA

THEY'RE FREE! WRITE TODAY

ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York City

Please send copy of your new "Industrial Guide." Also copy of your "Wiring Survey." (If you already have one of these books, check the one wanted.)

Signed _____

Company _____

Street _____

City _____ *State* _____

e Company

IVE *Sales Offices in Principal Cities*

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June EDITORIALS

Earl Whitehorne . . . . . Editor

Those Laws That Loom Ahead of Us

Old timers are appalled at the way government is now messing into the affairs of business. They think it is all wrong. Truly, some of it has caused a lot of trouble. But there is more to come than we have seen so far. What are we going to do about it?

The first thing is to understand the reason for it all. It is not just malicious meddling—this accumulating legislation. It is an effort—often bungling—to deal with half understood problems, that have grown out of the new conditions that beset the world today. Business men have not dealt with them in their own behalf. Now government is trying.

Fifty years ago, life in this country was local. Craftsmen and merchants found their customers in the neighborhood. Supply and demand and wages were regulated by local conditions, that were in plain sight. It was simple. But now business is national—international. Everybody's wages and costs and prices are affected by industry conditions, or by situations in other industries, that are often beyond his knowledge or his reach. It has made the whole economic structure so intricate, so ponderous and yet so sensitive to unexpected influences, that the individual business man today is powerless to deal with it. He can not even understand it.

Out of it all, has come inevitable confusion and strife. Long ago, industries tried to solve the new problems nationally, but there were too many short-sighted, selfish leaders who turned it into exploitation. Then came anti-trust laws and other restrictions and choked off this movement for necessary coordination. Later NRA made a valiant attempt at self-government in industry and died of politics and mismanagement. And there we are.

But the problems still exist and grow more pressing. So we hear increasing clamor for legislation to regulate wages, hours and conditions of employment and to control competition. The public feels that things are not right. They put it up to legislators who know no more than they. And out of it will come laws that may be either good or bad, helpful or destructive. They will bear on every branch of the electrical business. For we are so delicately adjusted today that nobody escapes.

There is only one way the electrical contractor can protect his interests this year and in the years directly ahead. He can support good legislation. He can condemn and help correct bad bills, that will affect his business. But he can only do this, if he speaks with the united voice of a national industry. Never have local and state associations—tied together nationally—been as important to the contractor as they are today.

And Speaking of Air Conditioning

And while we are on the subject, what is the electrical contractor going to do about air conditioning, any way? Is he going to be in it or out of it in the year ahead? Is it his field or will he play the part of a sub-contractor and for how long?

The market for air conditioning is just a-brewing. Some day all theatres, all stores, all offices, all public buildings, all institutions will be equipped for indoor weather control. Gradually, all homes will fall in line and central cooling will be as common as central heating, and with it will come a thorough conditioning of the air. On this scale, it is some years ahead, but because the business that will come out of it is so vast, it will take years to prepare, if the electrical contractor intends to have any important part in it.

Many contractors are already active in this field. They act as local agents for the larger air conditioning manufacturers. They engineer and install. They are the principals. The plumbing and sheet metal work involved is sub-let or becomes a department of their business, and air conditioning is locally established as the electrical contractors responsibility. How will it be in your town?

Good News From REA

Two bits of good news have come from Washington. First, the Rural Electrification Administration has decided to take positive action to get load built on the new farm lines. Second, George Munger has been given the job to do. Contractors should be well pleased. For Munger knows wiring and wiring is the key to rural load—any load. You can't build load on jerry wiring or skimped installations.

Munger knows wiring because for years he was contractor-contact man in the Hudson Valley for the Central Hudson utility. He became secretary of the local contractors' association, that linked several cities there.

He had a lot to do with the cooperative progress that has made that section famous. He was recommended to the Tennessee Valley Authority a few years ago, because here was a man who knew how to keep the government power development from going hay-wire on trade relations. He has done a good job.

Project managers are to be appointed now to build up load on REA co-op lines. Munger will be guiding them through a staff of field men. Here at last comes positive action to get the feet of these rural projects back on good ground. They must have load or they will not pay their way. They must get adequate and safe wiring into the farmers' homes and barns or there will be little load.

So the contractors of every rural area should get in touch with the new project managers. These men need help. They must understand why adequate wiring is vital to their success and why they need good wiring done by qualified contractors. Also, they must pay prices that will provide both service and safety, but at the same time take advantage of every economy possible in handling jobs in groups with standardized materials and methods. Munger can be counted on to support such constructive cooperation.

More Licensing

More state laws are in the making that purpose the licensing of professional engineers. These laws are of vital concern to engineer-contractors, as they seek to limit engineering service to those persons only, who have duly qualified as practicing engineers.

This movement is not new, of course. It began some fifteen years ago, and already license measures of this type have been enacted in some forty states. These laws vary in their effectiveness and engineering coverage and are still evolving. Only last year the State of New York dusted off its Professional Engineers Licensing law and revived its general enforcement. At present, there are statutes in process of development or in stages of amendment for Illinois, Michigan and the District of Columbia.

We wonder how much our electrical engineer-contractors know about them. Are they fair as to the requirements for a practicing electrical engineer? Or are they over-balanced as to non-electrical engineering requirements, such as structural, civil, or sanitary engineering? Will such legislation tend to prevent a practical minded engineer-contractor from engaging in system design work, appraisals, specification writing? How will such laws affect the rendering of every-day engineering services in neighboring states? These are all pertinent questions.

The manufacturers are involved too. Their problems are even more compiex, because their engineers must travel far and wide, without regard for state boundaries. Must they, like the inter-state vans, carry a complete set of engineer licenses for all states?

And After All It's Fairly Cheap

Every contractor who loves to slumber in the quiet shade of tradition should hate the gas stations. They have deliberately taught the public to expect local business to wash its face and shine its shoes and press its pants and put on a red tie.

And so the good old days are gone. Show windows can no longer be profitably used for parking dead flies. A dingy sign and a dismal store or office have ceased to be enjoyed. People now look for bright paint, glittering signs, well kept shrubbery, awnings, clean windows, natty uniforms and smiling friendly interest, as something they are entitled to when they hand out their trade. They think that stores and other places that look out of date and down at the heels, probably do not give very good service. So they pass by. And sometimes they are right.

Personality has always been important—to a business as well as an individual. It is important plus to the electrical contractor these days. And if the meaning of that is not clear—just look around town a bit.

How Much Are You Getting Out of It?

Some contractors let themselves become so busy doing good construction work that they forget to be good business men. How about that? It is an idea worth turning over in your cerebellum about once a week.

Ask your wife, anytime, what indicates success in any man's affairs. She will answer promptly that you can measure it in two very practical ways: 1. the amount of money he brings home, earned in his business; 2. the amount of time he takes for the enjoyment of life. Beyond that, there is satisfaction and credit in doing a good job. But the real test is—How much fun are you and your family getting out of it, year by year?

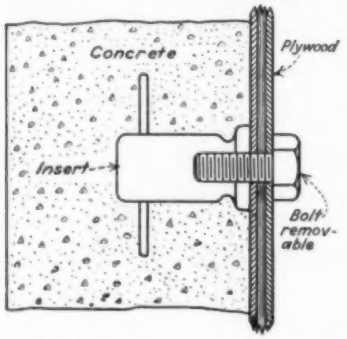
UMI

Methods of other CONTRACTORS

TEMPORARY ANCHORAGE—Brace prevents creepage while assembling lengths of large conduit.

PORTABLE MANHOLE CASTING FORM

Portable plywood forms are used by Globe Electric Works, San Francisco, in the construction of underground man holes for street lighting systems. Five-ply wood they find is light and



QUICK BOLTING — Cast-in-concrete inserts are quickly bolted to forms just where they belong.

accurately dimensioned. The corner pieces are beveled to make a tight fit and the large clean surfaces permit easier arrangement of inserts for various equipment. Holes are drilled through the plywood to screw metal thread inserts to the form which are then cast in the concrete.

Duct entrances are precast concrete blocks set and adjusted to the proper height to accommodate the incoming ditches. By suspending these blocks from two wires to the top of the form the precast block can be lowered or raised between the forms to its correct position.

The precast blocks are designed with a bevel, which provides more clearance for the incoming cable at the end of the ducts. On the outside of the form the bevel permits bringing the duct in at any angle and making a tight fit with concrete filled in to the beveled area. For portable use, Lloyd Flatland of Globe Electric Works advises oiling the plywood so that the forms may be stripped more quickly and leave a smoother surface. Oil also adds to the life of the plywood.

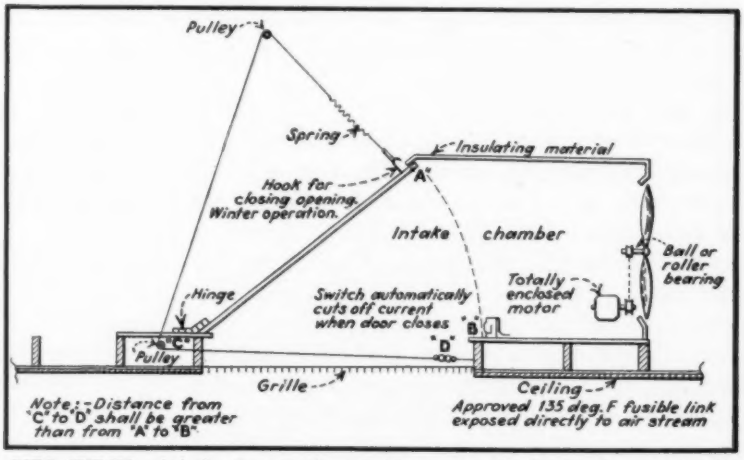
SMOOTH FINISH—Plywood forms make concrete manhole walls and corners finish up accurately.

CREEP PREVENTION

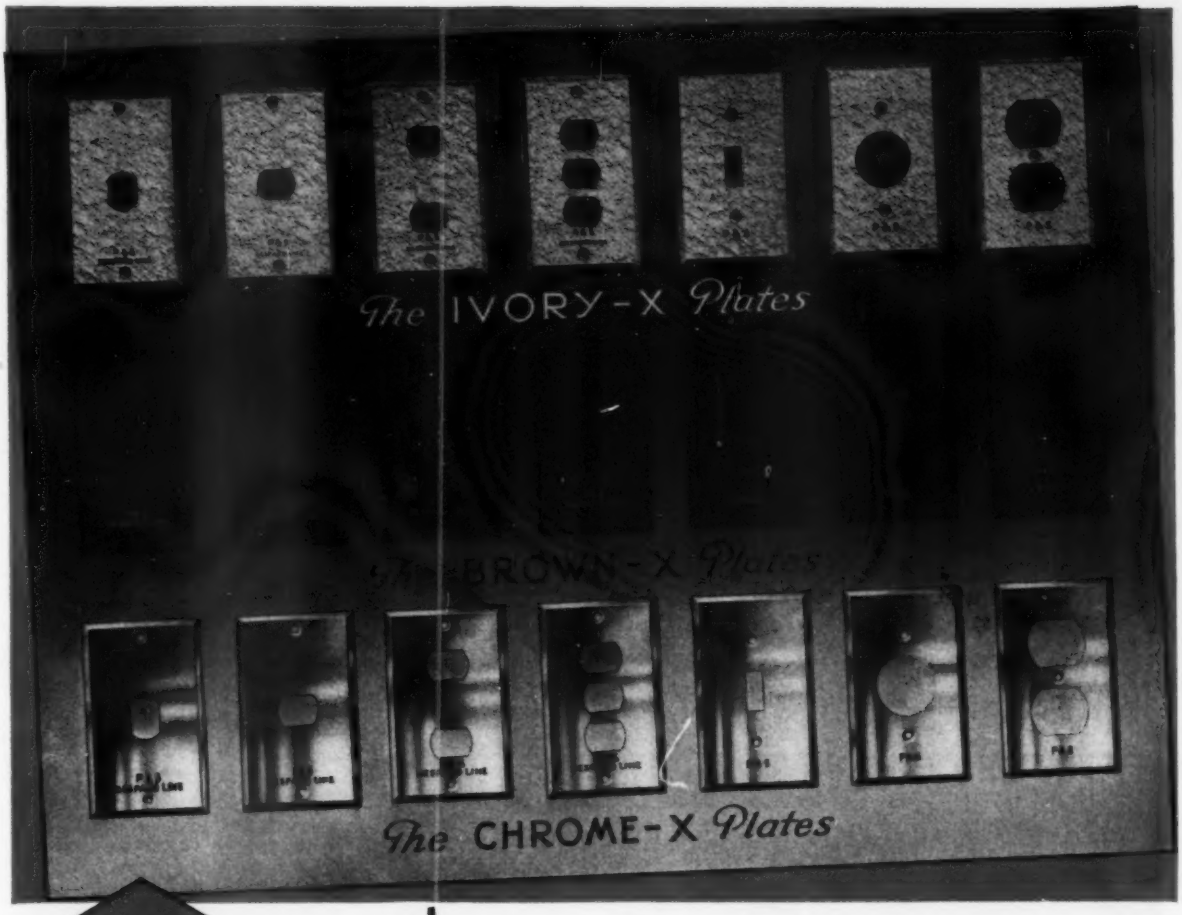
To prevent the creepage of 4-in. conduits along a series of trapeze hangers during the makeup of a 200-ft. run, the Martien Electric Company of Cleveland provided a temporary grooved-end wood brace against the elbow at the opposite end. This brace held the conduit elbow in line with a large junction box that was to be installed later at this point, while the long run of heavy pipe was butted together with pipe tongs at various places along the row of hangers.

AUTOMATIC CUT-OFF FOR ATTIC FAN

An attic ventilating fan in operation during a fire, increases the fire's intensity by the fan's added draft. So a plan has been designed to automatically shut off the fan and close the ventilating opening or ceiling grille under conditions of excessive temperature. A fusible link designed to operate at 135 deg. F. is interposed in a flexible wire or chain that holds a hinged door open. This link is exposed directly to the air stream. If the link becomes melted the door drops over the grille opening and at the same time operates a switch lever that disconnects the



FIRE CHECK—Attic fan is stopped and grille opening closed when fire melts fusible link. Prevents fan's draft from increasing intensity should a fire take place.



P&S Announces

NEW PROCESS METAL

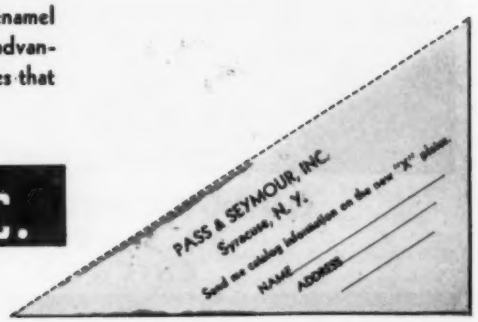
Wall Plates

In the new P&S "X" plates you have a set-up that tops anything the whole industry has to offer—new beauty—new durability—and new popular prices.

These plates are metal—with a multiple coat of baked-on insulating enamel—giving all of the style and zip of bakelite—with none of the usual disadvantages—they will not warp, crack, or curl—truly a royal family of wall plates that sparkle with sales appeal and add new profits.

PASS & SEYMOUR inc.

Syracuse, N. Y.



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THE DEPENDABLE
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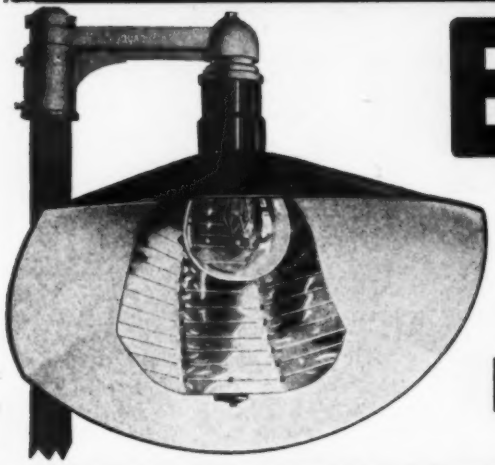

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OPEN TYPE

FOR
LIGHTING
LARGE
AREAS

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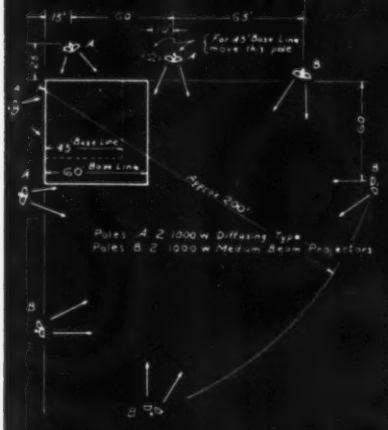
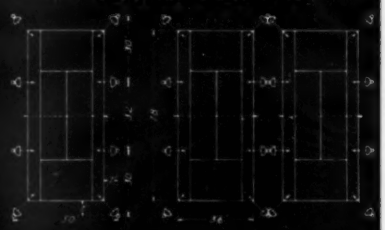


TENNIS COURTS



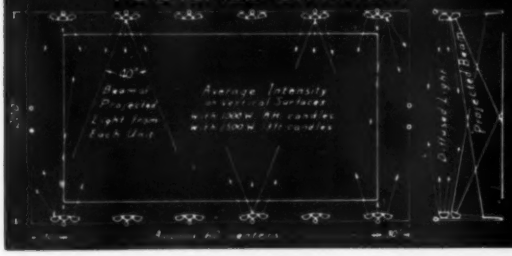
This new big size becomes a big factor in increasing sales for contractors. It is a big value, and does a big job along the lines of customer satisfaction.

Designed for 750, 1000, and 1500 watt lamps only. Reflector size 19½" to 26½".

The Alzak Aluminum projector delivers a longer, broader beam—without streaks or striations and the aluminum wire-enclosing bracket puts the light just where you want it—with only one bolt to tighten.

The New Type Bracket has a 40 deg. vertical adjustment, 20 deg. up and 20 deg. down, and in addition a horizontal swing of 180 deg. without moving the bracket. It fully encloses the wire. Write for details.

FOOTBALL GRIDIRON



QUADRANGLE MFG. CO.
32 S. PEORIA ST.
CHICAGO, ILL.

Methods of other CONTRACTORS

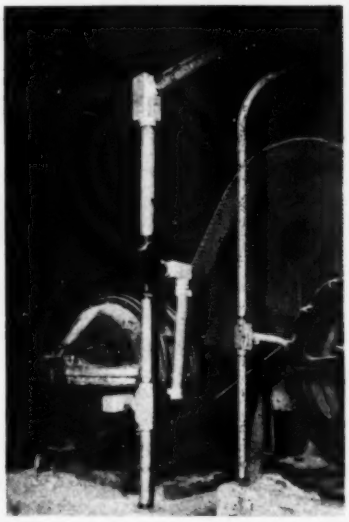
[FROM PAGE 50]

motor circuit.

The details of this arrangement were worked out jointly by the engineers of the Louisiana Rating and Fire Prevention Bureau, Paul Muller, chief electrical inspector of the New Orleans, La., inspection department and representatives of the local association of ventilating dealers. The drawing was reproduced from a blue-print submitted by Frank G. Camus, city electrician of Shreveport, La., where this requirement has already been adopted.

ANCHORING OVERHEAD RUNS

Not being permitted to run conduits across the floor, and having a high ceiling over these motors, the Sterns Electric Equipment Co. of Buffalo, routed conduits from the nearby wall at the right, and extended them down to rigid floor



Spanned Overhead—Floor flanged connections on motor foundations provide anchorage for conduits run overhead from nearby wall.

flange connections upon concrete motor foundations. These threaded floor flanges, fastened to the concrete with expansion shields, provided a rigid connection at the bottom ends of each run of conduit. Elbows at the wall-strapped portion of the run keep the overhead span in place.

The 75-hp., slip-ring elevator leg motor (left) was connected with one run of 2½-in. conduit containing the

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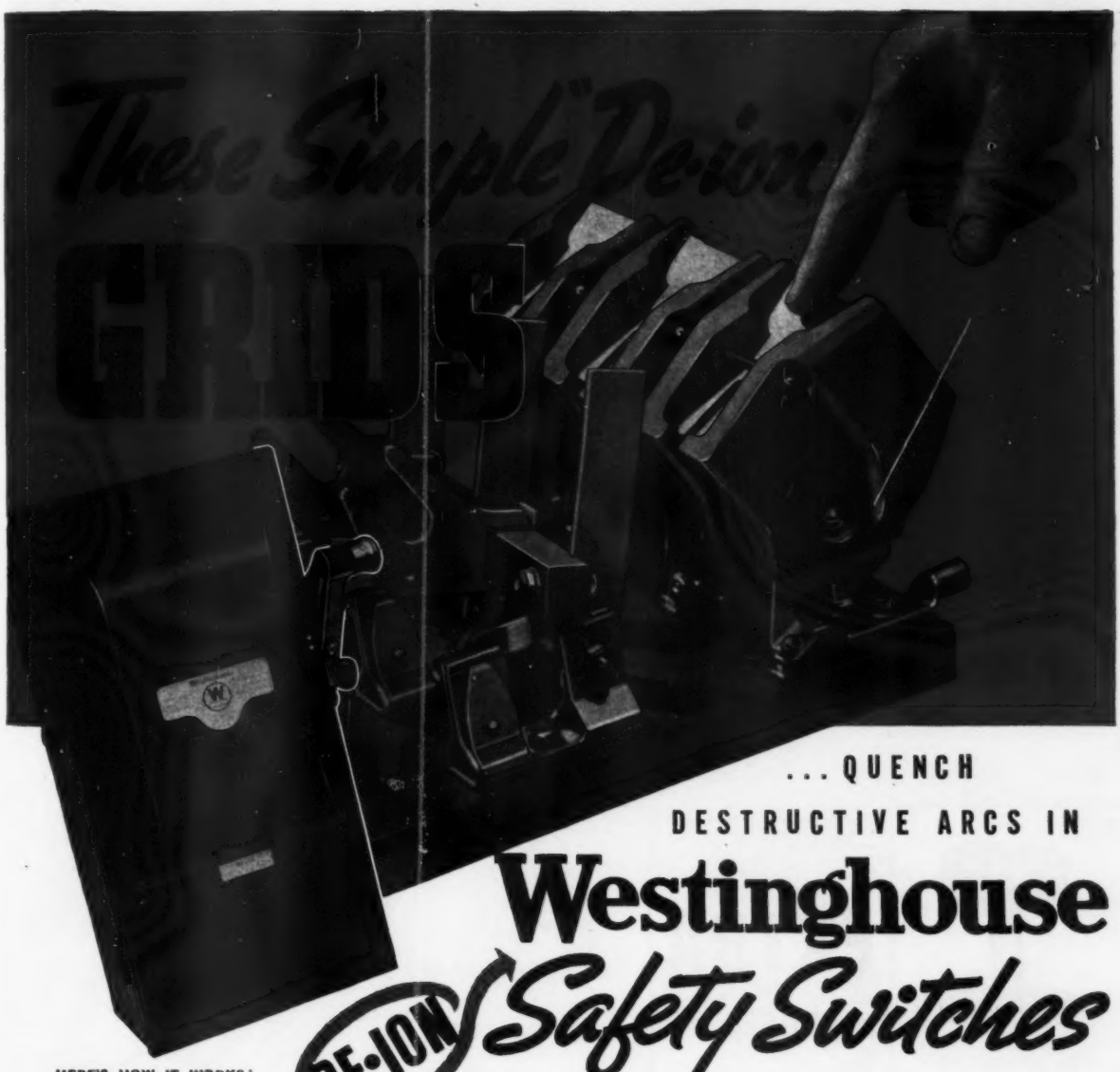


. . . QUENCH

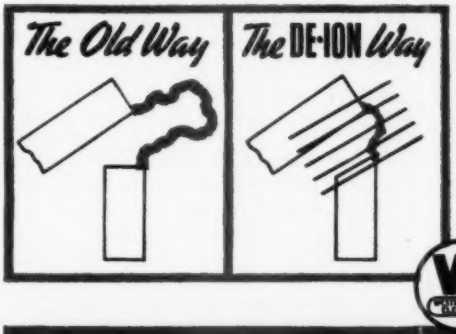
DESTRUCTIVE ARCS IN

Westinghouse

DE-ION Safety Switches

HERE'S HOW IT WORKS!

In the past, arcs have been broken by "stretching." The "De-ion" quencher on 575 and 600-volt Westinghouse switches confines, divides and extinguishes arcs instantly—obviously preventing concentration of burning heat on contacts or arc barriers.



It would be hard to overestimate the importance to safety, long life and low-cost maintenance of the famous and exclusive "De-ion" principle of arc extinction . . . employed in 575 and 600-volt Westinghouse Safety Switches. And it would be unfair to expect similar performance from a high-voltage safety switch lacking this feature.

Perfect contacts are further insured by another exclusive principle of design. The Diamond-Pointed Break Jaw and Extended Blade confine beading to a small area which falls entirely *outside* of the contact surfaces. Thus these surfaces remain clean, bright and close-fitting.

Simplicity and ease of inspection are further carried out through the use of one-piece or milled-and-ground copper parts on a one-piece non-carbonizing composition base. This eliminates most of the customary bolts and screws.

All sizes and ratings, Types A, C and D. Call your nearest:

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A SWITCH FOR EVERY PURPOSE . . . AC MOTORS . "DE-ION" LINESTARTERS . MAZDA CIRCUIT BREAKERS

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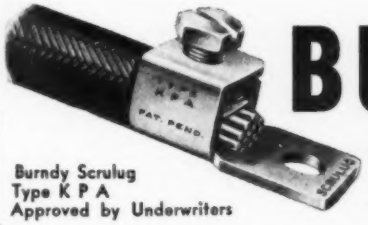
SCRULUGS

for quick, neat, trouble-free terminals!

● An ordinary screw driver is all you need to install the Burndy Scrulug. Ideal for switch box and panel board connections and for changing or disconnecting motors. Scrulugs are made in three sizes, each of which takes five sizes of conductors; a small stock will, therefore, accommodate a wide range of applications. *Specify Burndy Scrulugs for economy!*



Burndy Scrulug
Type K P A
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No. 284 DUPLEX RECEPTACLE NOZZLE

With ⅛" brass pipe extension. Neatest and most compact fitting obtainable. Also available with ¾" pipe extension. Fullman also offers Duplex Telephone Nozzles.

EXTRA
● **PROFIT**
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with

No. 130 "LATROBE" ADJUSTABLE WATER-TIGHT FLOOR BOX

No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Design eliminates many small parts. Cover plate 3½"—overall height 3½".

A Complete RESIDENTIAL, COMMERCIAL, INDUSTRIAL *Line*

"Latrobe" FLOOR BOXES AND WIRING SPECIALTIES

WRITE *for* CATALOG

FULLMAN MFG. CO. LATROBE PENN.

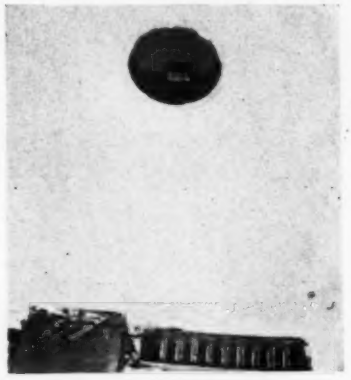
Methods of other CONTRACTORS

[FROM PAGE 52]

primary and secondary conductors. A spare 40-h.p. squirrel cage motor is kept available alongside for emergency use as a constant speed drive. This work was done in modernizing a local malt processing plant.

FIXTURE OUTLETS ACCESSIBLE

The trend toward flush ceiling fixtures in store modernization work presents a problem for the contractor, in placing the outlets to leave them accessible above the furred ceilings for future maintenance. A number of recessed flush ceiling fixtures were recently wired for by the General Wiring Company, during the remodelling of a large Youngstown, Ohio shoe store. Here 4 in. square outlets, for the connections to these fixtures, were placed edgewise beside each flush ceiling ring. After the plastering was finished, the circuit wires could be pulled in to all these outlets from the fixture openings, by working below the ceiling line.



EASY MAINTENANCE — Concealed wiring made accessible for repairs by placing outlets near flush openings.

From each outlet box a flexible steel conduit connection was looped from the top edge of the square outlet box into the threaded hub of the reflector hood. The square blank box cover and the fixture wire splices were left accessible from the fixture opening. If trouble should ever develop in the fixtures or in the concealed conduit runs, it will be possible to reach any outlet box adjacent to a flush fixture by pushing the fixture upward and moving it to one side of the flush opening in the plastered ceiling.

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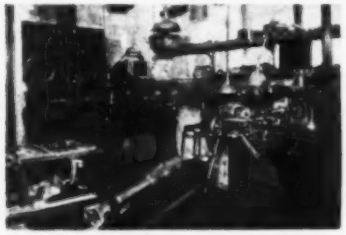
Among the MOTOR SHOPS

KEEP TOOLS IN PLACE

Machinists working here can find the reamer or drill bit they want when they want it, and without roaming off the reservation. It is the motor service shop of the H. N. Crowder, Jr. Company of Allentown, Pa.

Inexpensive wood shelves were placed along the wall on brackets for laying



ORDERLY TOOLS — Inexpensive shelves permit small machine shop accessories to be kept in order.

graduated sizes of reamers, twist drills, and other accessories in a flat position. Cleats were properly spaced on the shelf boards to serve as spacers or keepers for each size of tool. A wall panel with heavy hooks is back of the lathe (left) for holding chuck wrenches and other lathe accessories.

SHOWING A NEW SHOP

Every enterprising and growing motor shop organization is faced with the problem of telling the public its story of bigger and better facilities. The Electric Motor and Repair Company recently moved into new quarters in Raleigh, N. C., and prepared a handsome 32-page booklet for this purpose.

This booklet gives the history of the company since its incorporation in 1929, carries pictures of its officers, a group photo of 27 employees, twelve views of important departments in this modern plant, and other pictures of special industrial equipment or supplies. There are also eight 6-in. by 9-in. pages covering hints on how to prolong motor life; selection of wire and conduit for motors; carrying capacities of wire; transformer fusing tables; definitions of electrical terms; formulae for determining amps., h.p., kw., and kva., and useful formulae for calculating power transmission such as belt lengths, speeds, etc.

EXTRA LEADS, TESTS EASIER

All standard squirrel cage motors that are rewound by the U. S. Electric Engineering Company, of Cleveland, have nine identified leads brought out to the terminal housing. This is done to make such motors available for use on either 220 or 440 volt 3-phase systems without their being reconnected.

A copper name plate is placed on the

DOUBLE VOLTAGE — Nine leads brought out on rewound motors for use on two voltages.

motor beside the leads, stamped with numerals similar to those on metal bands that encircle each of the nine leads. These numbers occur on the name plate under 440-volt and 220-volt headings, and are marked with dots to indicate which leads must be tied together in order to group the coils for the desired system voltage.

Another reason for bringing out the leads for multi-voltage operations is to readily permit the operation of rewound motors at double voltage for shop testing purposes. A 5-minute double-voltage running test is given to rewound motors to show up possible shorts or weak spots in the windings.

FOR SMALL BAKING JOBS

A convenient "tree," made of pipe and fittings, is employed to bake a large number of small coils or rotors, at one time, by the Buzzell Electric Works, San Francisco. With a number of "branches"

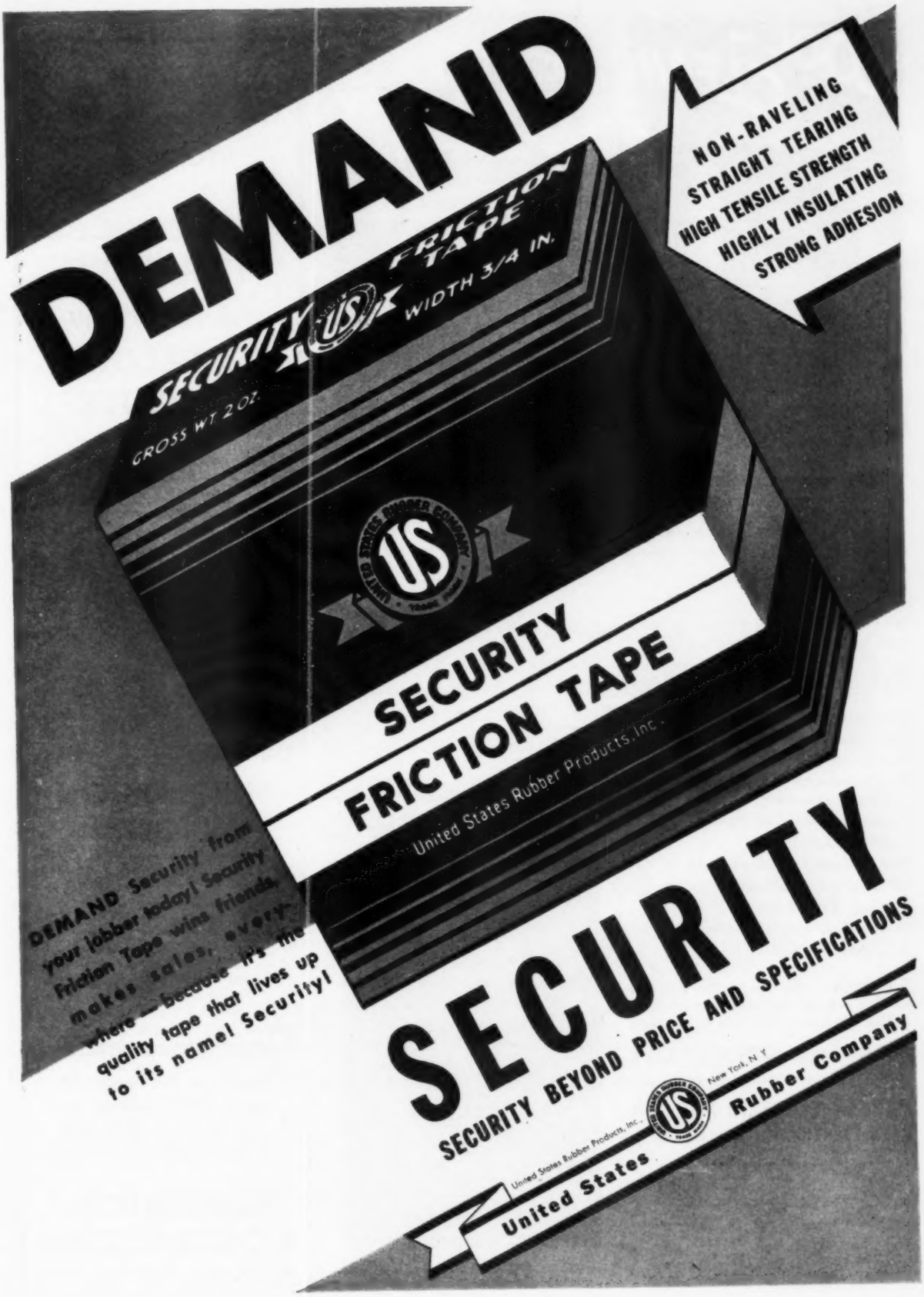
BAKING TREE—Pipe and fittings build it and you handle many small articles at once.

from the main trunk the individual coils, after dipping, can be suspended at various points. The entire tree rests on a moveable platform which slides into the bake oven on rails. Thus a large bake oven can be employed economically for many small items at one baking operation.

COMPACT REPAIR BENCH

Step saving is reduced to a minimum, in handling small motor rewinds by the Electric Service Company of Cumberland, Md. H. S. Hughes has arranged handy racks for spools containing various sizes of magnet wire, terminal leads, cord, tape, etc., so as to have everything within easy reach.

For chucking small shells or stators in a handy position for winding, Mr. Hughes made up a bench type swivel-base bracket. For arms it uses two connecting rods taken from a scrapped automobile engine. The wrist pin bearings serve as collars, through which take-up screws are threaded vertically to clamp the stator firmly in place. The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STRAIGHT TEARING
HIGH TENSILE STRENGTH
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DEMAND Security from your jobber today! Security Friction Tape wins friends, makes sales, everywhere — because it's the quality tape that lives up to its name! Security!
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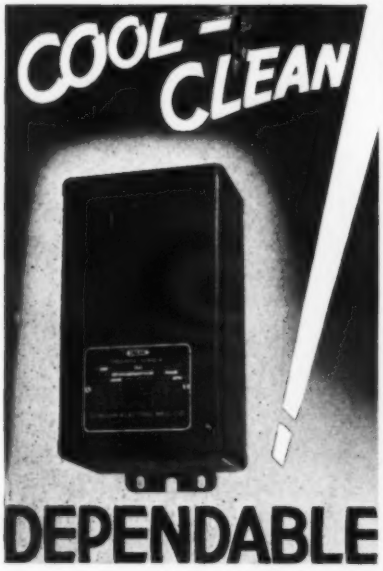

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Among the MOTOR SHOPS

[FROM PAGE 56]

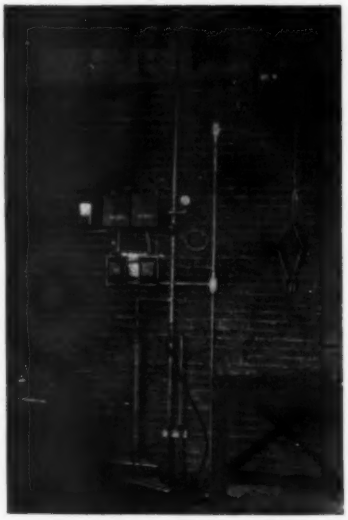
HANDY WINDING—Compact arrangement of spool racks and swivel clamp for stators saves steps in winding small armatures.

whole outfit may be swung to the left or right to any convenient position over the bench.

HOIST-POWER STRIPPING

The H. N. Crowder, Jr. Company's new Allentown, Pa. motor service shop is equipped with an electric hoist to yank out the old coils. It speeds up the job of stripping stators.

A diamond-shaped clamping yoke provides increased clamping tension on the coil ends as the hoist cable tightens up. Floor treadles, for "up" and



COIL YANKER—Electric hoist, with yoke for clamping to old coils, speeds up stator stripping.

In

ELECTRICAL CONTRACTING *for July*

"ELECTRICAL FEATURES *of the New* **MELLON INSTITUTE"**

"Super-adequacy" wiring in the finest structure of its kind ever erected, after seven years in construction, at a cost of between seven and eight million dollars. Only one job like this in a decade, but there are many interesting and unusual features applicable elsewhere. And it makes good reading!

Also

Editorial Feature Section

"EXPLOSION PROOF WIRING"

A whole section devoted to this all-important subject, including a complete list of what to use and who makes it. Valuable file material.

MANUFACTURERS:

Don't miss this important issue. Final closing, for complete copy and plates, June 20th.

ELECTRICAL CONTRACTING
330 W. 42 St., New York, N. Y.

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The Department of the Interior Building
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CRESCENT ENDURITE Rubber Compound is a super-aging, heat-resistant insulating material which exceeds Federal Specifications JC-106, required by the Government for installation in permanent Federal buildings.

Due to its superior heat resisting and high dielectric characteristics, it is especially suited for use when electrical conductors are required to meet abnormal temperature and aging conditions.

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THE SQUARE BOTTOM
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This square end has more contact area and so is more efficient but with no extra cost. Wolverine soldering lugs all have a notably flat contact surface and accurate barrel ends which allow a quick fitting.

Wolverine Seamless High Conductivity Soldering Lugs, made from raw material to finished product under one roof assures control of finished product.

Approved and listed by the Underwriters' Laboratories.

Ample stocks on hand. Every lug clearly marked. Packed in shelf cartons.

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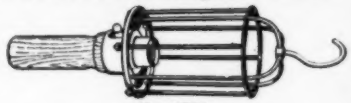
Wood Handle
Portable Lamp Guards

Try as you may, you can't beat McGILL *Wood Handle* Portable Lamp Guards for low cost, long life service. Wood handles last a lifetime — are shock-proof — and are not affected by oil or certain acids. There's a size and style of McGILL Wood Handle Guard for every need. Can be furnished with lever switch control mounted in handle, and with or without reflectors.



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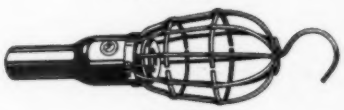

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McGILL MANUFACTURING COMPANY
VALPARAISO, INDIANA

Box No. 670

Among the MOTOR SHOPS

[FROM PAGE 58]

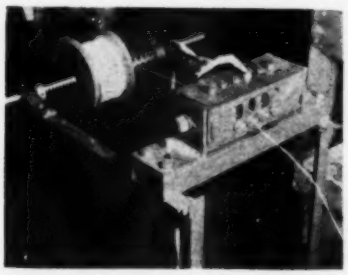
"down" hoist travel control, leave the operator's hands free to guide the clamping yoke as new bites are taken during the stripping operation. This

FOOT CONTROL—Up and down hoist travel, controlled by separate floor treadles, at stripping platform.

outfit was located in the parts cleaning room, to keep all dirty jobs away from other shop operations.

BRAKE FOR MAGNET WIRE

A brake to control the tension of magnet wire from spool to winding lathe is important. Buzzell Electric Works, San



WINDING TENSION—Four magnet wires can be fed through to contact the feeding speed.

Francisco, have one to control four wires at the same time. Mounted on one end of an angle iron rack, upon which the various spools of magnet wire can be placed, the wire is run through brass sleeves slit in the middle and polished so as to protect the covering on the wire. Pressure is applied to the top of the sleeve by means of a set screw. The sleeves are mounted in four parallel slots.

Where gangs of more than four wires are wound at once, a banked arrangement of three of these tension devices are fitted together.

Application
Installation
and MAINTENANCE
In Industrial, Commercial and Institutional Buildings

MODERN POWER DISTRIBUTION

Helps Cure Production Headaches

Efficient equipment operation . . . minimum power bills . . . no interruptions . . . safety . . . These should be the aim of the plant electrician as regards electrical distribution.

LAYOUT CHANGES IN JIG TIME

This flexible electrical distribution system at the Illinois Tool Works, Chicago, makes it possible to change production equipment and operations with minimum expense and delay. The duct shown running along the sprinkler pipe contains a copper bus-bar with numerous heavy-duty outlets. Such a system can be installed economically to take care of future requirements. It eliminates the need of distribution cabinets and intricate feeders.

Too often the plant distribution system is taken for granted. So as new equipment is installed, feeders are tapped anyhow and capacity is exceeded. Often, during a period of rapid expansion, a plant engineer condones defective splices and "haywire" extensions of service as temporary measures. But they later become permanent because no one gets around to doing the job over.

Symptoms of Poor Distribution

Symptoms of poor electrical distribution should not be looked upon as necessary evils. Here are some of the more obvious and annoying ones:

1. *Flickering lights*—This usually occurs, where the lighting circuits are not separate from power circuits, and branch feeders are of insufficient capacity. A momentary voltage drop occurs when a motor is started or some other sudden load is thrown on the line.

2. *Motors overheat*—If wiring is inadequate, there will be an excessive voltage drop between service entrance or switchboard and point of use. This means that motors must operate at lower than rated voltage. If they are loaded near rated capacity, they draw excessive current to deliver the required power, which causes them to overheat.

3. *Cables overheat*—This indicates too great an I^2R loss in the wires, and may be caused by inadequate wiring for the

UMI

load. Poor power-factor conditions or under-motoring may also, of course, be a contributing cause.

4. *Frequent outages*—If inadequate distribution causes excess current to be drawn at starting and at normal overloading, through low voltage at the motors, outages will be frequent. Where fuses are used instead of rapid-reset breaker protection, valuable time may be lost. Here, again, poor power factor or under-motoring may be the primary cause.

5. *High power bills*—Actual energy loss is usually not as important as operating difficulties, where wires and cables are not heavy enough. However, real opportunities for saving on power-bill by cutting maximum-demand charges, will be lost if circuits are not properly segregated to permit smoothing out the plant load curve.

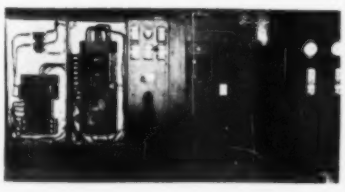
Putting Them High and Dry!

Flooded wiring is no longer a menace to the German Brewing Company of Cumberland, Md. A new high-and-dry location has been found for the main switchboard, transformers and motor-generators. When Willis Creek poured over its channel in March 1936, this company's wiring system was badly crippled. So a modernization program was started that included the placing of new main distribution and transformer equipment about 22 ft. above the ground, which is also 14 ft. above the record flood crest.

Before-and-after views show the former obsolete and considerably overloaded main service equipment, also the new equipment as it looked when nearly completed.

A new main distribution board is being installed by the Queen City Electrical Repair Company, with a 1200-amp. main oil circuit breaker, and 15 branch circuit breakers, ranging from 50 to 400 amp. There are five sets of meters and current transformers for measuring departmental current consumption. An outdoor gallery on the wall, back of the switchboard, supports three 50-kva power and one 25-kva lighting transformers. Two panels at the right are for power company primary meters. The vacant space between is reserved for a future panel.

The old main service equipment is shown above. It was located at floodable level and is to be taken out. The new circuit breaker distribution, set high above the record flood crest, is shown below.



"Diagnosis"

One of the principal causes of a poor distribution system is the fact that equipment changes and additions have been made gradually. New circuits are added, and old circuits are loaded more and more, with no great change at any one time.

The best way to keep a system from becoming overburdened, under such conditions, is to make definite periodic checks of voltage, current, and load conditions.

In last month's Maintenance Section of ELECTRICAL CONTRACTING, rough, but useful means of estimating motor loads were given. Voltage and current readings should be taken at the switchboard or service entrance, to determine voltage drops in feeders, and to guard against exceeding code requirements for the loading of circuits.

For d.c. feeders, a portable ammeter with a suitable shunt and leads can be employed. Of course, switchboard instruments may already give the required readings at source of supply.

For a.c. feeders, a split-core current transformer with portable ammeter can be used for testing feeder and motor loads over the entire system. When current transformers are used, the meters should never be disconnected while the core is around a line carrying current, or dangerous potentials might be built up at the instrument leads.

Periodic megohmmeter tests of insulation resistance in feeders and circuits should also be made.

Some Cures

1. *Lighting*—Wherever possible, lighting and power circuits should be separate. Watts of lighting per circuit, and the floor area per circuit, should conform to local code requirements.

Minimum specifications for adequate wiring usually call for 1,000 watts per circuit, and a floor area of 400 sq.ft. per circuit.

2. *Proper motor operation*—As important as choosing adequate wiring for a given load is the grouping of the loads in "load centers", to keep down the length of branch feeders. If possible, main feeders should be at higher voltages, to cut down line currents and hence line voltage drops. Transformers at strategic places will permit minimum runs of the operating-voltage circuits.

Many plants do not go to higher voltages, because they consider each addition separately, and hesitate to spend money for a complete change-over. Often there is some fear of voltages higher than 440 volts. However, engineers today are giving serious consideration to the use of 2,300-volt or even 6,600-volt motors, when capacities of 25 hp. or more are required. Lower-voltage motors or motor groups are served from a transformer.

3. *Freedom from interruption*—The decision as to how elaborate protection should be to guarantee continuous operation, depends upon the damage likely to result from a power failure.

Some plants actually employ single circuits for their motors—that is, instead of a group of feeders going out from a substation or branch panelboard, the motor circuits are carried all the way back to a substation switchboard, where each is protected by a circuit breaker.

Feeder Length

Of course, to be economical, all substations in such a system must be so located as to keep feeder lengths down—say, to within 250 ft. Excess copper will also be avoided if each circuit is designed for its particular load. This system might even require less copper than the standard scheme of branch circuits extending out in "tree" form, because in the latter, main conductors must be made large as an elementary provision for expansion.

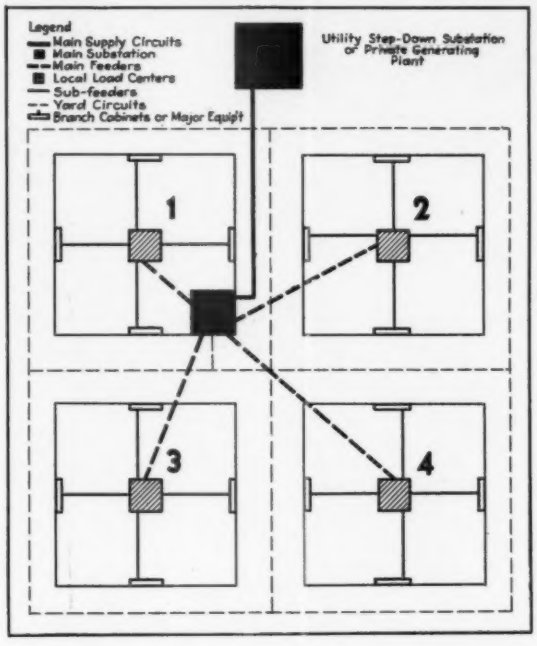
The big advantage of the single-circuit system is that trouble in motors or control affects only individual circuits, and the maintenance electrician does not have to waste time tracing out branches or taps, to locate a blown fuse or an open breaker.

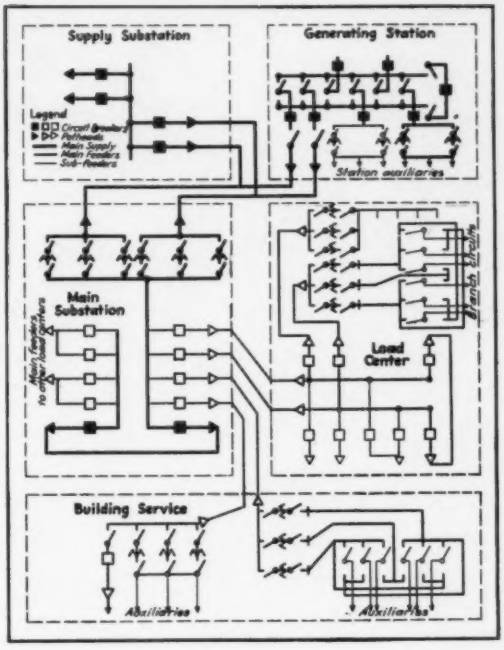
4. *Temporary overloads*—Where the nature of the work makes frequent short overloads unavoidable, it will usually be economical to use quick-reset breakers instead of fuse protection. Then service can be restored immediately without prolonged idleness of equipment or men.

5. *Power economies*—The greatest opportunity for power economies, as regards the distribution system, is in the

(Continued on page 64)

ELECTRICAL MAINTENANCE GUIDE CHART





TYPICAL INDUSTRIAL POWER SUPPLY

Relative importance of main supply, circuits in main substation, main feeders, local load centers, subfeeders and branch cabinets is indicated by the order named and by the symbols. Branch circuits rank next in importance, but are omitted for simplicity. Relative importance of circuits in each class is dependent on load.

Actual circuits may be in multiple for increased service reliability or ease of handling. Looped circuits may be employed in place of radial type for increased service reliability. However, the trend is to make individual circuits highly reliable instead of depending on duplication.

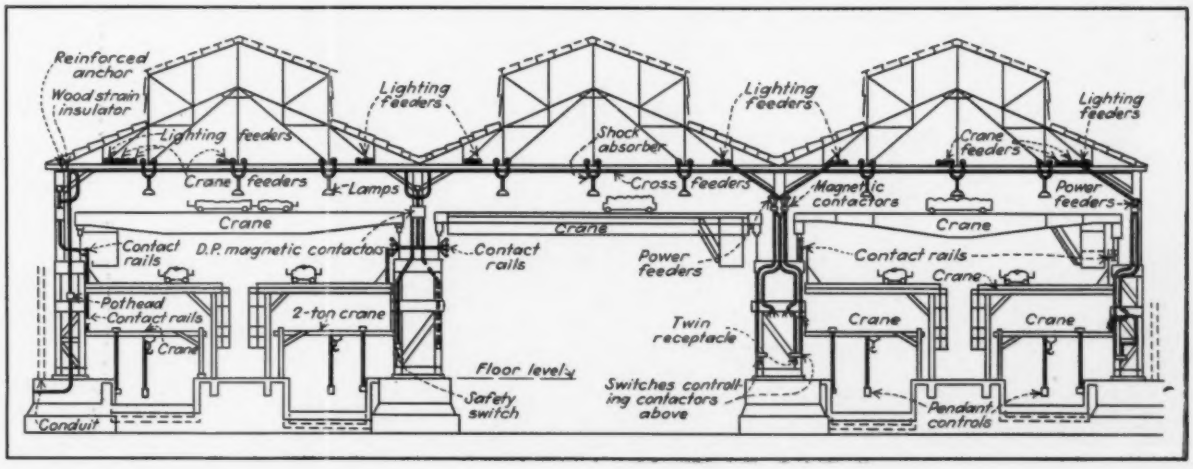
VITAL CIRCUITS OFTEN FORGOTTEN

Branch circuits, which are omitted for simplicity, deserve proportionate consideration for reliable service. This diagram shows elements of the simpler schematic sketch on the left, but shows only one line for each circuit, even though it may have several conductors. Disconnects are used for isolating all circuit breakers, but are not shown for simplicity. In this installation truck-type breakers with bayonet disconnects, taking the place of regular blade-type disconnects, are used in the main substation and load centers.

MEETING INDUSTRIAL CIRCUIT REQUIREMENTS

This particular installation employs underground cables between main supply, main substation and load centers in separate buildings. Inside the buildings, aerial construction above roof girders and along tops of columns is used extensively for feeders. Branch cabinets are also near tops of columns, accessible by elevated walkway. Branch circuits or subfeeders run down columns in conduit and thence under floor to equipment or control. Branch cabinet contactors are controlled remotely from floor.

Courtesy Anaconda Wire & Cable Company



Modern Power Distribution

[FROM PAGE 62]

reduction of maximum demand. Circuits should be so arranged that when the load passes a certain point, equipment of secondary importance can be quickly disconnected.

6. *Circuits for portable equipment*—Portable equipment is becoming more and more important. Long cords should be avoided, by supplying a sufficient number of outlets. All outlets and cords should be rugged enough for rough handling.

7. *Flexible distribution*—Flexible distribution systems are gaining popularity. They make it easy to rearrange equipment and to attach motors to the line, at any place. They save time by making elaborate conduit installations unnecessary.

Heavy outlet plugs may be located at various places in the ceiling, over a large factory area, and all equipment connected by means of flexible cable or rubber-covered wire. Or, the distribution may be effected with relatively heavy busbar throughout the plant, to which leads from driving motors are attached with special plugs.

Eliminate Breakdowns, Reduce Power Bill

In the mill of H. W. Rickel & Co., Detroit, breakdowns in the group drive were frequent. They would paralyze the operations for hours, until a hot or worn bearing, a special gear, pulley or belt was replaced.

All equipment was driven from one 95-hp. motor on the first floor, through a system of belts, pulleys and gears. The main shaft was belted to a jackshaft in the basement. Another belt connected the main shaft to a line shaft, 130 ft. above. Large speed reductions were required. An example was the elevator drive, which operated at 41 r.p.m.

To overcome the high maintenance cost and numerous delays in operation, individual drives, totaling 91½ hp., were installed on all equipment. One 3-hp., one 15-hp., and one 20-hp. gear unit, each with an output speed of 41 r.p.m. and furnished with a totally enclosed, fan-cooled, 1,800-r.p.m. motor, were installed on the elevators. The grain conveyors were equipped with two 3-hp., two 5-hp., and two 10-hp. gear units with an output speed of 140 r.p.m., and furnished with the same type of motor as above. On the cleaners, two 5-hp. gear units were installed with motors same as above. On another cleaner a 7½ hp. 1,800-600 r.p.m. gear motor was installed.

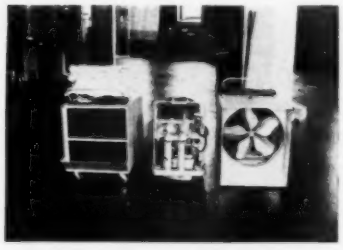
By making these changes costly breakdowns, fire hazard and noise were eliminated, maintenance became negligible, and equipment was operated with greater flexibility and at better speed. Another real advantage gained was that the changeover cost—$5,500—was realized in two years by lower power cost despite the higher connected load.

No More Trouble With Dust!

A study of the dial equipment in a Cincinnati Bell Telephone Exchange for 1935 showed 24 per cent of the central office trouble caused by dirt and lint in the contacts and other mechanism. To clean the sequence switches, where 50 per cent of this trouble is encountered—as well as other portions of the frames—a pressure cleaning unit was developed by Bell System engineers.

The cleaning equipment consists of suitable curtains to enclose the frame to be cleaned, an air compressor and two exhauster units. The compressor and exhausters operate on 110 volts and may be plugged in at any convenient outlet.

Curtains are placed so as to enclose the frame on all four sides. The top is left open. The two exhauster units are placed at one side and at the bottom, in curtain openings, so as to draw the air from the curtained area and exhaust it through filters to the outside. The filters consist of spun glass impregnated



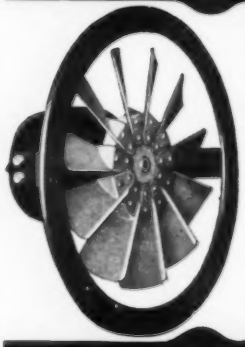
PRESSURE CLEANING—*Compressor unit (center); exhauster unit on both sides, filter end (left), blower end (right)*

with petrolatum, which effectively traps particles of wool and cotton fiber, dirt, and lint present in almost microscopic form in the air.

The operator carefully blows the dust and lint from the contacts and mechanism inside the frame. He is equipped with a 1/16-in. nozzle which is supplied

(Continued on page 68)

Multi-blade
EXHAUST FANS



The exclusive design of Peerless Multi-blade exhaust fans insures quiet operation with large air capacities and low power consumption. Wherever you install them you will find these characteristics highly appreciated:

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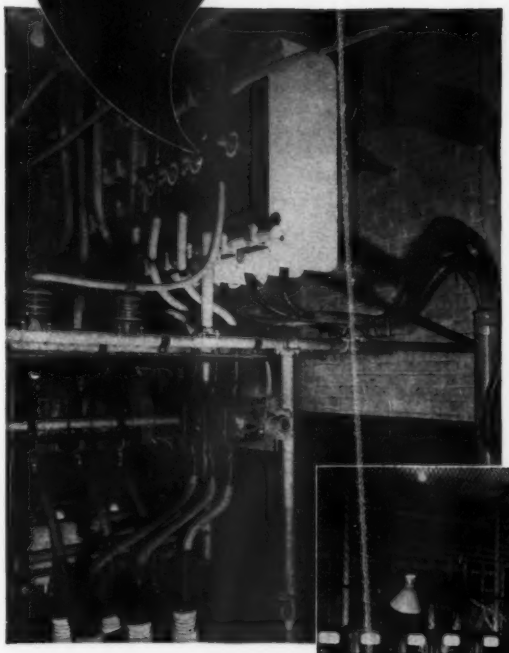

Three years of uninterrupted service with Harvel Oil Stop cable insulating material.

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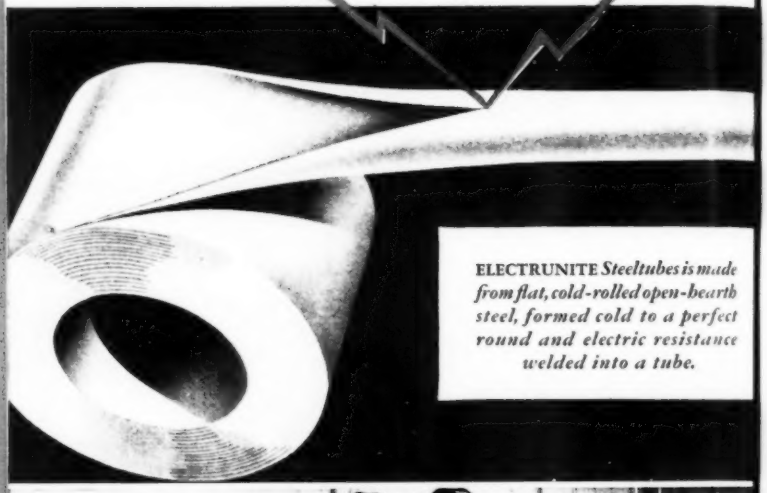

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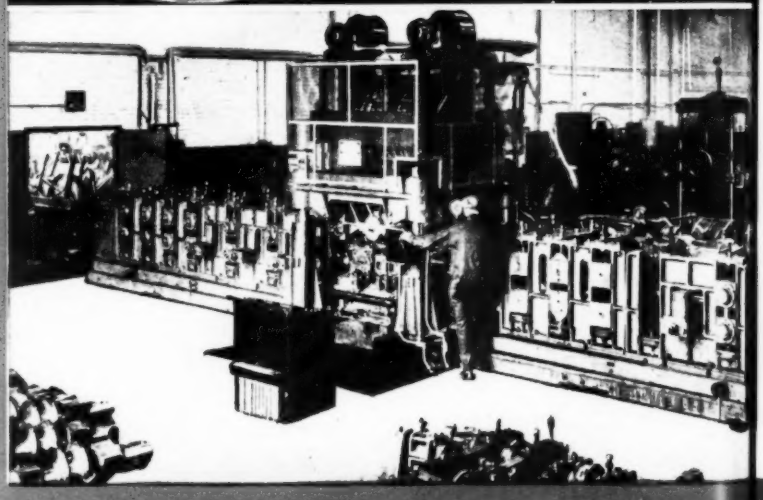

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with dry compressed air at a pressure of from 20 to 70 lb. per sq.in., and wearing goggles and a respirator. The blowing operation is from top to bottom, and from the side opposite the exhauster units, toward them, so as to avoid re-contaminating clean portions of the frame, from which foreign matter has already been removed.

This method of cleaning, including the testing of equipment, requires an average of 4.7 man hours per frame, as compared with about 4 man hours per frame for the vacuum method and no testing. Equipment performance and appearance are so much better that the period between cleanings is expected to be lengthened. Even new equipment is cleaned by this method before being placed in service, to remove bits of insulation, wire clippings, solder, and other particles.

Results have been extremely favorable even though the pressure cleaning is only a few months beyond the experimental stage. In one instance, the average of 206 cases of trouble per month dropped to 183 cases, and in another, from 150 to only 64 cases. The older the office, the better the results obtained.

The compressors and exhausters operate on 110 volts and may be connected to any convenient outlet.

Summer Is Just Around the Corner

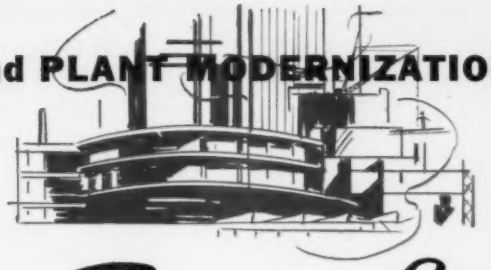
Now is the time to get ready for those warm and humid days. Here are a few points for consideration:

1. Is the ventilating system adequate and economical?
2. Have any changes been made in the layout of the department where ventilating equipment is in operation?
3. What additional equipment will be needed, such as blowers, motors, control, ducts and screens?
4. Can cooling units be used with the existing system?

How Much Vibration?

Reduction of vibration and noise is becoming increasingly important in engineering and maintenance work. Vibration studies have been made with a device known as a Crystal Vibration Pick-Up. The complete equipment consists of: (1) a duralumin test prod with a crystal mounted inside, which flexes and sets up voltage impulses; (2) a

FOR NEW BUILDING and PLANT MODERNIZATION



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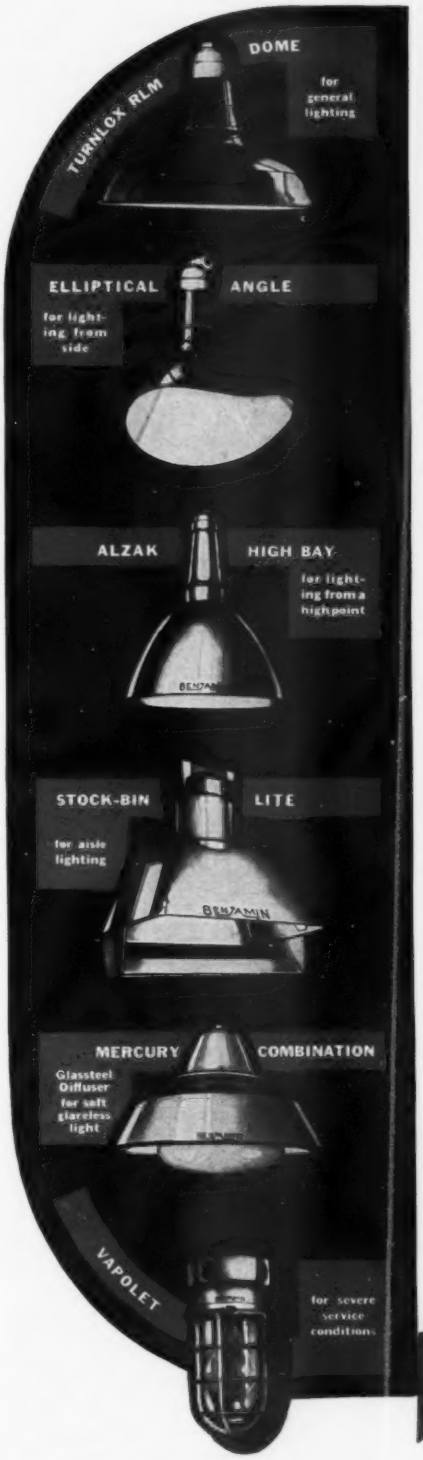

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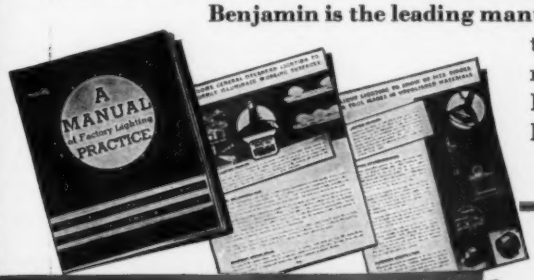
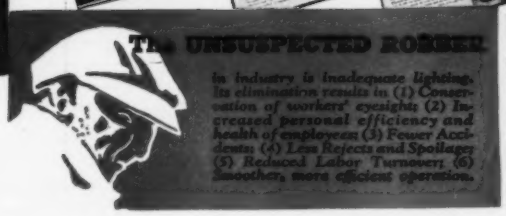
As the years roll along, you will have ample proof of how Benjamin quality and Benjamin design and construction insures maximum lighting efficiency and reduces maintenance costs. And your production and personnel records will give eloquent testimony to the fact that "Right Seeing" conditions are just as important as "Right Machinery" to lower production costs and higher work standards.

As an aid in securing "Right Seeing"—as a means of visualizing the "Right Light" for specific operations, Benjamin's new "Manual of Factory Lighting Practice" will be of real assistance. You are cordially invited to write for your complimentary copy of this 36 page book. It outlines 30 common industrial lighting problems and their solutions; gives further evidence why Benjamin is the leading manufacturer of industrial lighting equipment. Benjamin Electric Mfg. Co., Des Plaines, Illinois.




THE UNSUSPECTED ROBBER
in industry is inadequate lighting. Its elimination results in (1) Conservation of workers' eyesight; (2) Increased personal efficiency and health of employees; (3) Fewer Accidents; (4) Less Rejects and Spoilage; (5) Reduced Labor Turnover; (6) Smoother, more efficient operation.

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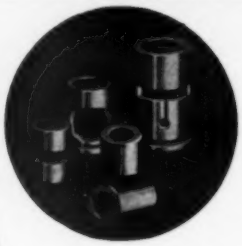

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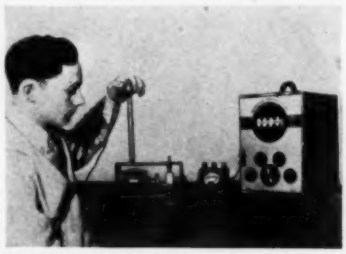
built-in amplifier and a voltmeter on the output, to determine the frequency, amplitude, and velocity of vibration, in some cases (3) a speaker attachment is used to make very small vibrations audible so that they can be compared.

The device is so sensitive that it will pick-up the vibrations from the escapment of a wrist watch, also it will withstand vibrations up to 1/16 in. amplitude. A partial list of applications on which vibration study with this set-up may be used includes: gear trains, fans, air conditioning equipment, electric motors, ball bearings, and locating source of vibration in reciprocating or rotating machinery; checking relative smoothness of surfaces, such as paper, polished metal, glass plate, checking longitudinal rods for fracture, and the relative efficiency of materials for deadening sound.



TESTING VIBRATION—Pick-up device placed on frame of motor drive, vibrations registered on oscilloscope.

Dealer NEWS

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Selection, Installation and Fusing of Signaling Transformers

By EDWARD S. RUTH,
Edwards & Co., Inc., Norwalk, Conn.

Signaling transformers require additional care and forethought in selection and installation. If a good transformer of proper size is selected, and is properly fused on the secondary side, it should last a lifetime. They require very little, if any, servicing, because of their construction.

The primary and secondary windings of the average signaling transformer comprise a single form wound coil, around which is assembled a shell type steel magnetic structure, built up of laminations. The complete assembly is fastened in a steel containing case which is then filled with a molten wax. The presence of a small quantity of melted wax protruding through the seams of the steel case is a warning signal that the transformer has been operating at too high a temperature probably due to an overload, ground, or short circuit.

If the primary or secondary winding burns out or grounds to the laminations, the wax compound must be carefully melted out of the case and laminations. This is a very messy job and the cost of replacing the damaged coil will probably equal, if not exceed, the cost of a new transformer. The complete coil must be replaced if only a single tap of the secondary winding is damaged.

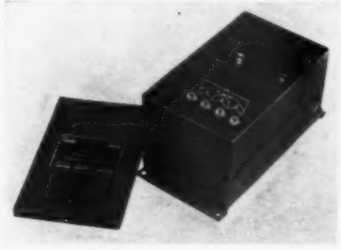
Other types of signaling transformers have the same general construction, except that the wax is omitted, and the laminations are held together and in place by iron machine screws. In transformers of this type, it is reasonably possible to remove the laminations from the coil and replace the coil. However, the primary and secondary windings in the majority of the transformers of this

construction are also of the unit coil type, and a burnout in one winding requires replacement of both.

Very few signaling transformers are built with separate primary and secondary coils, and arranged so that each coil can be removed without disturbing the laminations of the other. This type of construction is common to both small and large size distribution transformers, but seldom encountered in the signaling line, except perhaps in the sizes of 1 kva., or larger.

Signaling transformers are really a line of heavy duty bell ringing transformers. They differ from the ordinary bell ringing variety in that they are made in 50-watt sizes and larger, and will not withstand overloads for other than a very short time. Signaling transformers must, therefore, be fused properly on the secondary, or low voltage side.

Bell ringing transformers of 25 watt or smaller sizes are designed with high-resistance primary and secondary windings which limit the output and permit



WAX FILLED—Shell type signaling transformer, wax filled, with single coil and built-in conduit box.

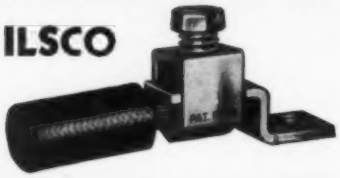
short-circuiting the secondary terminals indefinitely without overheating. Overloads or short circuits in the low-voltage signaling system to which these transformers are connected will not damage them or burn out the windings. They are much lower in output than a transformer of equal size, in which resistance windings are not used.

The average bell ringing transformer is rated at five to ten watts, and labeled about six or eight volts. The "no load" voltage is generally about 25 to 50 per cent higher than the name-plate voltage rating of the transformer. This "no load" voltage drops down to the name-plate voltage when the transformer is used to ring the average door bell and considerably lower when heavier loads are connected.

Signaling transformers are generally furnished with multi-tapped secondaries, and labeled 4, 8, 12, 16, 20 and 24 volts. The "no load" voltages are only about five per cent higher than these values and the "full load" voltages about ten

SIMPLE, ISN'T IT?

ILSCO



SOLDERLESS CONNECTOR

NOTICE: The ***triangular wedge*** formed by the tang and V-bottom collar, which forces the wire into a ***solid mesh***—

NO set-screw contact . . .
NO flattening or separating of wires . . .
NO limitation to one size wire . .
NO shearing effect whatsoever . .
NO special tools required to make connection . . .

NO need for you to search any longer for the PERFECT Solderless Connector—WE HAVE IT!

Ilsco solder lugs show the size of the largest wire they will take.

FREE—A large display board, containing mounted samples of ILSCO lugs. Sent upon request.

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road. Cincinnati, Ohio

HERE is a *GADGET that GETS YOU IN

The Model "DM" MEGOHMER.

*(See page 20 of May Issue of Electrical Contracting)

The Model "DM" Megohmers are getting the leading electrical contractors in on "rewiring" jobs and getting them "out" at a profit.

Clark and Mills, Boston sold 481 rewiring jobs with the aid of a Model "DM" Megohmer. Why don't you get one? Start by filling out this coupon.

HERMAN H. STICHT & CO.
DEPT. EC., 27 Park Pl., New York.

Send Bulletin 176C.....( )

Name .....

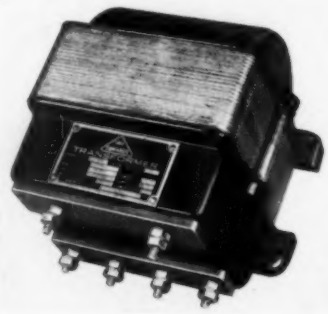
Firm .....

Address .....

.....

Elec. Contr. 6-37

per cent lower than given on the nameplate. Standard sizes are rated 50, 100, 250, 500, 750 and 1,000 watts. The ratings are based on using the highest voltage tap on the transformer and the use of any of the lower voltage taps reduces the watt rating proportionately.



DRY CORE—Shell type signaling transformer, dry core, with single coil.

Transformers should be fused according to the maximum safe continuous current permissible in the full secondary winding. This value can be approximated by dividing the rating in watts by the rated voltage of the full secondary winding. The figure obtained should be somewhat higher than the rating of the fuse selected. The lower voltage taps will usually withstand slightly higher currents, but it is a safe rule to fuse all taps with a fuse of the same rating as that required for the full secondary winding. Proper fusing of the secondary circuit limits the current to approximately the safe continuous current for the transformer secondary.

Larger currents may be taken from the secondary for a short time without damage to the windings. However, currents considerably in excess of the safe continuous current will blow a fuse of the proper rating to protect the transformer against continuous overloads. This situation is quite common in low-tension signaling systems, where signals are required to operate for very short periods of time. In such cases a circuit breaker with a thermal time element must be used if the transformer is to be adequately protected. Continuous overloads will trip such breakers and prevent damage due to overheating.

Circuit breakers with a thermal time element are rather expensive, and it is usually more economical to use a larger size transformer, so that the maximum current demand for the system will be the same or slightly lower than the maximum safe continuous current for the transformer. Recently, however, fuses with a thermal time element have been placed on the market and they are quite suitable for signaling transformer protection. They are inexpensive and easy to install.

Whether a circuit breaker, ordinary fuses, or thermal time element fuses are used, transformers will never give satisfactory service unless they are installed in a suitable location. They should not be exposed to extremely high temperatures, corrosive or damp atmospheres, and should receive as much circulation of air as possible.

High Cycle Sanders Increase Production

Spot welding is one of the operations in the manufacture of movable steel partitions, doors and accessory equipment at the plant of E. F. Hauserman Co., Cleveland, Ohio. In finishing these items the spot weld marks are dressed-off with portable electric sanders as shown in the illustration.

Twelve high cycle sanders were installed to improve the efficiency and speed of the operation. They operate at 5,400 r.p.m. from a 220-volt, 180-cycle circuit and use seven inch sanding discs. One frequency changer set supplies 180 cycle power for all twelve sanders. The set has a capacity of 10 kw.; primary rating, 220 volts, three phase, 60 cycles, 1,800 r.p.m.; secondary rating, 220 volts, three phase, 180 cycles.

***HIGH CYCLE SANDER**—Spot weld marks dressed-off with portable electric sander, production increased.*

The additional cost of these machines over the ordinary universal-motor sander was quickly repaid in increased production. This was made possible by the higher and more uniform speed and lower maintenance costs of this new equipment.

For Better LIGHTING JOBS

LUMINOUS WEDGES A NEW IDEA

by G. R. LaWall
General Electric Company, Nela Park Eng. Dept., Cleveland

Enclosed types of displays are customarily lighted by lamps placed behind or between the luminous faces. Within certain limits as to proportions, there is an even less expensive means which yields excellent lighting and provides interesting innovations in form.

When the faces of the display are placed at a proper angle to each other, they may be given a brightness of satisfactory uniformity, when lighted by relatively few lamps in a parabolic trough reflector at the base of the wedge. Either one or both faces may be translucent. An angle of from 17° to 22° between the two glass faces assures a very acceptable distribution of brightness as well as good proportions.

Pattern or background or the entire element, may constitute the luminous portion, as the case may demand. Weight is reduced and installation and guying simplified, and the display has an appearance of lightness, neatness and finish.

Typical applications and construction for such a display are shown in the accompanying sketch and photograph. The part of the panels near the lamps is lighted in large degree by direct light, while the reflection from the trough reflector and cross reflection between the glass surfaces build up the brightness at the thin edge. The trough, of course, should have a polished surface of high reflection value. Any opaque surfaces of the display also should be highly reflecting and somewhat diffusing. The glass should be of a diffusing variety.

CONSTRUCTION—Two lamps in reflector bases illuminate both sides of inexpensive display.

CANADIAN PREPAREDNESS

Here is a glimpse of the material that is used when some outdoor party or exposition needs to be temporarily lighted up in Windsor, Ontario. The Millen Electric Company goes in for such work with thoroughness, keeping

READY FOR LIGHT—Partial view of Canadian contractor's stockroom, where temporary exposition lighting materials are kept for quick installation.

on hand an average inventory of $3,000 worth of reflectors, outdoor floods, cables, sockets, and other trimmings.

Some random items of ready-to-go stock are: 250, 14-in. RLM's; 15 sign reflectors; ten 500-watt angulars; six 1,000-watt floods; 2,500 ft. No. 4; 1,000 ft. No. 2; piles of 9-light streamers; scads of bulbs. And, as they say on the country sale bills, "many other articles too numerous to mention."

HIGH LEVEL LIGHTING FOR PRIVATE OFFICE

Although 20 footcandles usually satisfy the seeing requirements in private offices, levels of illumination in excess

CONTRAST CONTROLLED—General lighting, supplementing a downlight equipped with four 150, 200, 350 three-light lamps. The fixture is wired on two circuits for flexibility.

of 50 footcandles can be provided when desired. But with indirect lighting at these levels the ceiling is likely to become too bright for eye comfort, unless it be unusually high or unless there are beams which shield the bright ceiling from the normal view of the occupants of the office.

A good way to provide these high values is to use direct lighting units of the downlight type, shielded or louvered so that their brightness is very low at the normal viewing angle. With a system of this type, it is necessary

WEDGE SIGNS—Thin wedge shaped displays provide distinctive signs with economy in lighting bill and low construction cost.

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FUSES made to Protect

SAVED A RE-WIRING JOB for a RICHMOND HIGH SCHOOL

HERE ARE THE FACTS

SAYS Mr. Morris Hunter, *Electrical Contractor of Richmond, Va.*

"When the school was completed it was found that the 100 ampere fuses on the vacuum cleaner circuit would not hold the motor starting currents.

"Faced with the possibility of pulling out the conduit, wire, switches and fuses and to replace them with material of a higher capacity the school authorities decided to call me in on the job. I suggested that BUSS super-lag fuses be installed. This was done.

"There has been no further trouble with fuses blowing on starting currents and the cost and inconvenience of a mean re-wiring job was saved."

—not to Blow!

you too, can SAVE TIME AND MONEY BY PREVENTING SENSELESS SHUTDOWNS *caused by* NEEDLESS BLOWS

Thousands of executives who once thought such waste was a necessary evil have found that there is literal truth in the saying that BUSS fuses are "Made to protect—not to blow."

To them BUSS fuses have proved a boon. Senseless interruptions of operating schedules caused by needless blows have been eliminated. Better protection has been given equipment—for BUSS fuses permit fuseing nearer to the load. On new installations considerable money has been saved for, as in the case of this Richmond High School, it is often possible to use smaller size switches or fuse blocks when BUSS fuses are installed.

Obviously there are definite reasons . . . .

GET THE FACTS

All set forth in easy to read style in the BUSS book on "Fuses made to protect—not to blow."

You will quickly see how BUSS fuses protect your pocketbook in two ways.

1. By safeguarding equipment, plant and persons against electrical hazards—

2. By preventing wasteful interruptions of operating schedules—due to needless blows.

Your name and address will bring your copy by return mail.

BUSSMANN MFG. CO.
University at Jefferson, St. Louis, Mo.
Division of McGraw Electric Co.

BUSS super-lag fuses are available thru Electrical Wholesalers

WHY BUSS FUSES DON'T BLOW NEEDLESSLY

10 FEATURES *and* **SUPER-LAG**

The

in the design of the FUSE-CASE help make it possible . . . .

development in the FUSE-LINK completes the job.

BUSS Super-Lag FUSES

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Extra lighting value with the same operating cost—that's *Plus Value* merchants appreciate and want!

Yet, despite superior performance, Sterling Lite-Flo Reflectors cost no more than ordinary reflectors. That's why so many contractors find Sterlings a big help in closing new contracts.

Why not cinch the show window lighting business in your community by quoting on Sterlings? We'll help you by furnishing carefully engineered layouts that incorporate the last word in efficient display lighting. Just mail the coupon.

REFLECTOR & ILLUMINATING CO.
1435 W. Hubbard St.

☐ Please furnish detailed lighting layout for windows described on attached sketch.

☐ Send catalog on STERLING Reflectors and brochure on STERLING Front-Line Lighting.

Name .....

Address .....

For Better LIGHTING JOBS

[FROM PAGE 73]

to illuminate the ceiling and side walls otherwise the contrast between the brightly lighted work and the relatively dark side walls and ceiling is too great for comfort. The illumination for relieving the contrast may be provided by indirect luminaires, coves, indirect torchieres, or wall brackets.

LIGHTING AN ESCALATOR

Lumiline lamps are used to outline the underside of this escalator. The aluminum equipment used in the lighting harmonizes with the aluminum trim of the escalators.

FOR LIGHTER LIFTING—Indirect lumiline in decorative lighting for an escalator.

The reflecting surface is lighted indirectly, from concealed clear lamps, and that part of the trough which appears luminous has a wire brush finish with the brush marks running parallel with the axis of the lamps. This surface texture serves to spread out the image of each lamp to produce uniform lighting. Light-toned shadows opposite the lamp holders lend interest to the lines of light. The clear lamps create a sparkle when viewed close up.

HOW IT IS DONE—Aluminum housing hides the lighting installation.

DAYLIGHT FOR ENGINEERS

To build good automobiles requires precision engineering, and good lighting helps Olds designing engineers do their work. Here is a partial view in the new engineering department of the Olds Motor Works at Lansing, Mich. It is a combination mazda-mercury vapor installation.

According to B. C. Fowler of the Barker Fowler Electric Company, who did this work, there are about 150 of these combination indirect units. An average of 50 foot candles is claimed. The reactors for the high intensity mercury vapor lamps are housed in the round combination enclosure-canopy at the ceiling, from which the fixture stem projects.

PLEASANT EYEWORK—Some mazda-vapor lighting in the engineering department of the Olds motor plant, provides near daylight at 50 foot candles, for busy designing engineers.

"DE-ION" MEANS Compact Design TO ME", SAYS THE MACHINE DESIGNER

●Over and above its values to users of Westinghouse motor starting equipment, the word "DE-ION" has a very specific meaning to the machine designer. By banishing the arc hazard this exclusive Westinghouse principle permits close mounting of Linestarter units or contactors for built-in control applications, with no possibility of "flash-over" to adjacent parts. "De-ion" design also permits compact enclosed starters without sacrifice of accessibility and wiring space. Important, too: "De-ion" Linestarters are smartly styled to match today's most modern industrial equipment. Only Westinghouse Linestarters have all the modern Motor Starter advantages *plus* "De-ion" design. Call or write your nearest: J 20330

WESTINGHOUSE OFFICE ELECTRICAL WHOLESALER
MOTOR DEALER

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

● **BUT "DE-ION" ALSO MEANS:**

DEPENDABILITY
LONG LIFE
LESS UPKEEP

Every one of these features has an important meaning to plant owners, maintenance men, electricians and machine designers. You get them all in Westinghouse "De-ion" Linestarters.

Ⓦ Westinghouse "DE-ION" LINESTARTERS

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Questions ON THE CODE

Answered by F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Flexible Conduit in Concrete

Q. *We desire to extend existing conduit to connect additional outlets in an old building. Is it permissible to use flexible metallic conduit in a channel cut into a concrete flooring, then filling in again with concrete. Or, would it be better to place the flexible conduit in the cinder fill beneath the concrete flooring, replacing both the cinder filling and the concrete flooring?—A. W S..*

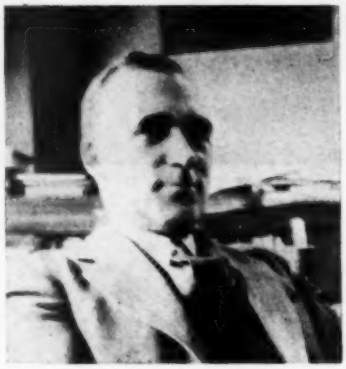
A. Probably this is best answered by the wording of the rule governing this, which will appear in the 1937 Code as Section 3504, under Cinder Fill. "Conduit, unless of corrosion-resistant material suitable for the purpose, shall not be used in or under cinder fill where subject to moisture, unless protected on all sides by a layer of non-cinder concrete at least two inches thick or unless the conduit is at least 18 inches under the fill."

Therefore, where the cinder fill is not subject to permanent moisture the flexible conduit can be placed right in the fill without even the protecting envelope of non-cinder concrete.

Number of Lamps on Branch Circuits

Q. *How many 25 watt 115 volt lamps can be put on a branch circuit? It seems to me that we should be able to use 69, as 69x25 W. equals 15 amps. But how can we get around the 12 outlet per circuit rule?—F.B.*

A. If the sixty-nine 25 watt lamps are contained on fixtures and on not more than 12 fixtures, they may be placed on one branch circuit. Or, if on more than 12 fixtures, requiring more than 12 outlets, they may still be placed on one circuit provided they are within a floor area of not over 500 sq.ft. and are in a residence. In other than residential occupancies, the limitation of 12 outlets per circuit must not be conceded.



MILL SPECIALIST:—Few who know L. P. Dendel of Lansing, Mich. realize that "Pete" is more or less the originator of our present-day totally-enclosed-fan-cooled motor design. As supervising engineer for the Michigan Millers Mutual Fire Insurance Co., with whom he has been associated for 21 years, Mr. Dendel helped grain elevator and flour mill clients design enclosures for their motors. Finally the motor manufacturers adopted these principles as integral design. Dendel is chairman of Michigan's Electrical Administrative Board, secretary of the state association of Mutual Insurance companies, an alternate on the Electrical Committee of N.F.P.A., chairman of Code sub-committees in charge of new Articles 300, 370 and 620. He was recently appointed to head a special N.F.P.A. committee of seven to make a review of existing state laws, and to draw up a model state law.

Feeders Inside Entrance Switch

Q. *Is it permissible to connect two or three sets of feeders to the load side of a service entrance switch? —J. H. B.*

A. We assume that the service fuse is on the supply side of the service switch. Therefore, our correspondent inquires about connecting more than one feeder onto the load side of service equipment, without supplying separate fuse protection for each feeder.

This would be permissible provided the service fuses are of the proper size to protect the smallest feeder so connected. Naturally such an arrangement would not be economical, as the full capacity of all of the feeders could not be employed. The size of the fuse would not permit this.

Q. *If the above is permitted may more than one lugged conductor be connected under one terminal nut or screw or must the conductors be in one lug only?—J. H. B.*

A. More than one wire must not be connected under one terminal nut or screw, unless the terminal has been approved for multiple wires. If separate lugs are to be used, the terminal screw must be of sufficient length and strength. Otherwise use a single lug.

Grounding Private Plants

Q. *The Code does not seem to definitely state at what point a three-wire d.c. system in a factory with its own generating plant should be grounded. What is the ruling on this? —R.S.*

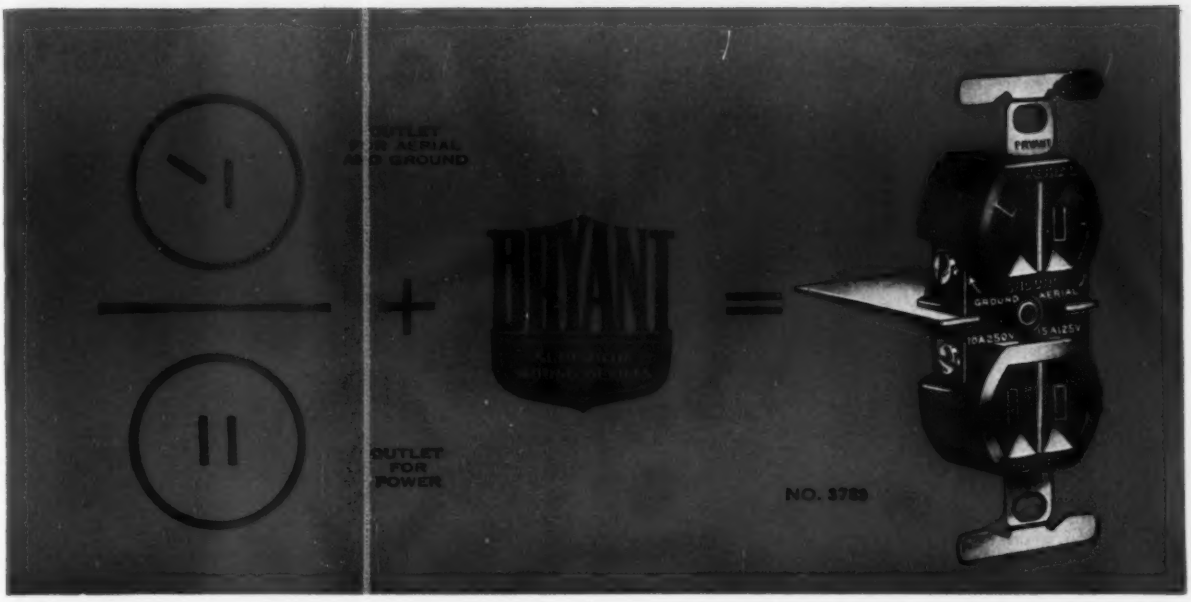
A. This grounding should be made at the generator control board, on the neutral lead from the generator to the control board.

Elevator Feeders in Multiple

Q. *In a certain building there are eight elevators with two feeders from the service to the roof, each feeder supplying four of the elevators. Is it permissible to connect the two feeders together on the roof, so that if one feeder went bad the other one would be able to supply the motors?—R. A. B.*

A. Conductors in multiple are permitted only by special permission from the inspection department having jurisdiction. But even with the special permission, it would not be proper to connect the feeders together at the upper end only. They would also have to be connected together at the lower end. Also the fuses, if used in multiple, would have to be connected to each other at both ends.

Careful consideration should be given to such a proposed rearrangement before attempting it. With the present arrangement, the blowing of a feeder fuse would put only half the elevators out of service and the occupants of the building would still have the use of four elevators. With the feeders connected together, a short in the feeder would blow the fuses and put the entire elevator service out of commission. Under certain circumstances, this might



A COMBINED RADIO AND POWER OUTLET ADDS TO THE PLEASURE OF RADIO

Add up the features of the Bryant No. 3789 combined Radio and Power outlet and they total *better radio reception and more radio convenience for your customers*. Small and compact in wall area, it does away with unsightly wires.

Two-gang combinations (shown below) provide current for clock, lamps, etc., in addition to aerial, ground and radio power.

One blade on the No. 3790 Radio Cap is set at an angle to prevent accidental connections to power outlet.

With additional sets for various rooms a growing trend, Bryant Radio Outlets are a source of increased radio satisfaction throughout the modern home.

Sold through Electrical Wholesalers

RADIO OUTLETS PACKED IN KITS

NO. 22184
Combination of aerial, ground and power outlets with cap and plate.
NO. 22183
Same as above with 2-gang box cover with divider.

NO. 22149
Aerial and ground outlet.

NO. 4832
Power outlet.

NO. 22145
Combination aerial, ground and power outlets with No. 3790 cap.

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NEW YORK 100 East 42nd St · CHICAGO 844 West Adams St · SAN FRANCISCO 325 Ninth St

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SUMMERTIME
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BUILDING TIME

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Don't miss the July and August "business building" issues of ELECTRICAL CONTRACTING — read during the busiest season of the year by the men who buy and install electrical products.

ELECTRICAL CONTRACTING, 330 W. 42, New York, N. Y.

Questions ON THE CODE

[FROM PAGE 78]

place the occupants in a hazardous position.

There was a suggestion, made about a year ago, that requirements be made that each elevator motor in a building have its own feeder from the service. Then, in case of fire, as many elevators as possible could be kept running to get the people out of the building.

Armored Cable in Rain

Q. *A new frame building was wired with armored cable, before the roof was complete. A rainstorm of two or three days duration gave the entire frame work and cable wiring a thorough soaking. Has this caused any damage to the cable and must I take out all of it and put in new cable.—G. B.*

A. The person to decide this question is the inspector for this job. If, after everything is completely dried out, and the inspector finds that the armor of the cable has not rusted, he undoubtedly, will not condemn it. If the steel armor has been properly galvanized the rain should not have damaged it. As the wires inside the armor are rubber covered, they will not be damaged by the rain.

I-Beams in Transformer Vault

Q. *The roof of a transformer vault is of 6 inches of reinforced concrete built on the top of I-beams. Is it necessary to cover the I-beams, which support the roof but are beneath it, with 6 inches of concrete?—C. H. S.*

A. There is nothing in the Code which would require the covering of the I-beams with concrete.

Number of Outlets Permitted

Q. *On an open wiring job, where cleat receptacles are used, would each receptacle be considered an outlet?—F.B.*

A. "Yes, in the case just cited, each lamp receptacle would be considered an outlet and but twelve could be placed on one circuit, unless, of course, this was in a residence. In this case, any number of receptacles could be installed on one circuit, within a 500 square foot area. But it is not probable that open wiring would be used in a residence.

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FIRST to be SEALED in CELLOPHANE
STRONG DISTINCTIVE GREEN CORE
COLORFUL ATTRACTIVE BOXES
PERFECT ADHESIVENESS and TENSILE STRENGTH
Made by A COMPANY IN THE INSULATION BUSINESS SINCE 1878
¾ PANTHER FRICTION TAPE NO 5
CELLOPHANE WRAPPED
PANTHER
FRICTIO
¾ HAZARD INSULATED
THE OKONITE
¾ FRICTION DRAGON TAPE 8 OZ
DRAGON
NET WGHT. FRICTION TAPE
¾ HAZARD INSULATED WIRE WORKS DIVISION OF THE OKONITE COMPANY 8 OZ
¾ FRICTION DRAGON TAPE 8 OZ

PANTHER *and* DRAGON TAPES

HAZARD INSULATED WIRE WORKS
Division of
THE OKONITE COMPANY
Factories: Wilkes-Barre, Pa. Passaic, N. J.

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Questions on SIGNALLING and COMMUNICATION

Answered by ALBERT A. SCHUHLER

Circuit Interruption Indicator

Q. *We want to have some means of knowing when a certain circuit is interrupted in our plant. The system operates on 110 volts, 60 cycle, A.C. When this circuit opens, we want a horn to operate in the factory, and a lamp to light in the Superintendent's office. What suggestion have you to offer for such a system?*—B.D.

A. The simplest way to handle this is to connect the coil of a heavy duty type relay, wound for closed circuit service, on 110 volts, A.C., across the two feed wires of this circuit. The source of current for operating the horn may be obtained from another 110 volt source of supply, or it may be taken from a battery, so that this emergency circuit may be independent of any other source in the building. The contacts of the relay will be used to close the circuit to the signals, connected in the same manner as a single pole lighting switch.

Ordinarily, the relay may be of the non-locking type, because as a rule, the signals are only to function during the period of interruption. As soon as the source of current is restored to normal, the relay is returned automatically to its normal position, and the horn and the lamp will cease to function. On the other hand, a locking type of relay may be used, which would operate the signals even after the current supply has been restored. It would be necessary in this case, to restore the relay manually, by operating a plunger or some mechanical device.

Adding Bells in Audible Paging

Q. *We wish to install another riser of bells in our audible paging system so that the signals may be clearly audible in all parts of every floor. The present circuit relay seems to be carrying the maximum load, and our plans for the increase in signals will double the load. How shall we provide for the change in this system?*—K.K.

A. There are two ways of handling this problem. You can use a master and two sub-master relays. Or, you can use a two-circuit relay.

The first method is preferable, as it will enable additional circuits to be added by simply installing extra relays for each contemplated circuit. One relay, known as the master, has its coil connected directly to the code transmitter circuit as at present. The contacts of this master relay, and the source of current are used to energize the coils of two sub-master relays. The contacts of the two sub-master relays and the source or sources of power energize the respective bell circuits.

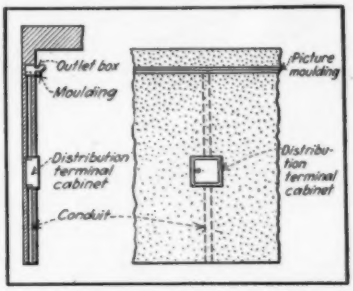
In the second method, the coil of the relay is connected in the same manner as at present. Each pair of contacts, and the source of current are used to energize their respective bell circuits.

Running Wires from Conduit to Mouldings

Q. *Occasionally it becomes necessary to run low-tension wires and cables for signaling and telephone systems along picture and other decorative mouldings. This is done usually as a matter of convenience, although it often is the only way to conceal these wires without removing flooring or channeling walls. What is the best method to follow?*—H.T.R.

A. In the accompanying illustration, a convenient method is shown. Some existing low-tension outlet may be used, or one may be installed in order to bring the wires up to the mouldings. The wires may then be run loosely in the groove of the moulding, and be carried to the location desired.

By inserting a pipe nipple through the wall, the wires may then be carried from a corridor to a room, or from one room to another. Wires and cables may also be run along the base of a wall or behind the baseboard. Special mouldings may also be obtained for completely concealing the wires at this point.

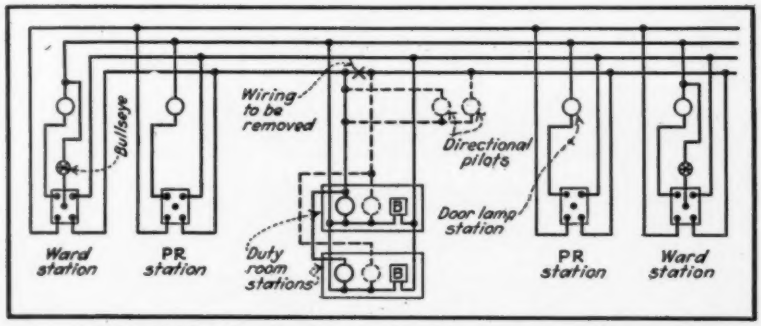


A WAY OUT—Simple method of carrying low tension wires from pipe to moulding.

Directional Pilots for Nurses' Call

Q. *Our hospital desires to place lamp signals at the intersection of the corridors, to give additional signals to the nurses, and save extra trips to the stations. Our present system is of the low-voltage type, using five-way private and ward room stations. In addition we have the usual door lamp stations, and single pilot and buzzer stations in duty rooms and nurses' stations.*

The pilot and buzzer stations are so arranged that they now serve half of a U-shaped corridor, with two nurses' stations on each floor. We want one



STEP SAVING—To signal source of call to nurses and avoid waste time

Instruments detect Losses

TO WHICH NO EAR IS SENSITIVE

● Energy lost . . . fuel wasted. That's the unmistakable story told by the hiss of escaping steam. There's nothing subtle about a steam leak. It shouts its presence . . . crying aloud for a remedy.

But electrical losses cannot be heard . . . cannot be seen. They might go on forever without being detected.

Unsuspected, a 50-hp. motor may be laboring under a 75-hp. load, wearing itself out, encouraging insulation failure, and lubrication trouble. Or a 75-hp. motor may be loafing on the job with only a 50-hp. load, operating at low efficiency, wasting current, and boosting costs.

There is only *one* efficient and economical load for any electrical device, and that is its name-plate rating. And there is only *one* reliable means of determining load conditions . . . *the consistent use of electrical instruments.*

But even the intelligent use of electrical instruments is not enough unless the test data has the reliability and accuracy assured by Westinghouse Portable Instruments. J 40090

Type A Recording Voltmeter with 24-Hour Chart for A-C. Service.

Type PY-2 Large Portable Double-Range A-C. Voltmeter.

Type PX-4 Small Portable Double-Range D-C. Ammeter.

INDUSTRIAL ANALYZER—Type TA for making complete a-c. tests up to 125 amperes, 600 volts on single, two or three-phase circuits.

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ELECTRICTUBE
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ENAMELKOTE

A bird in flight — smooth, swift and definite — like Electrictube that has a hard, smooth, flexible interior enamel covering which doesn't buckle or flake. Makes wire pulling much easier than in ordinary conduits.

Why not let us tell you more about Electrictube with many new easy working features that saves time and money.

Companion conduits of this line are Galvakote, Enamelkote and Hotkote; a complete line you'll be glad to know and use.

CLAYTON MARK & CO.
OPERA BUILDING
CHICAGO, ILL.

Questions on SIGNALLING and COMMUNICATION

[FROM PAGE 82]

lamp to take care of the front half of the corridor, and one lamp to take care of a side corridor.—H.T.

A. In order to operate the system in the manner outlined—(1) Add an additional lamp in the present duty room and nurses' station pilots. (2) Add two lamp pilot stations at the intersection of corridors. (3) Split the pilot wire on each floor.

The wiring diagram, shown on p. 82, shows a typical system such as you describe in solid lines. The necessary changes and additions are shown in dotted lines. The X indicates the section of the present wiring to be removed.

Automatic Resetting For Motored Clocks

Q. *A customer has a system of twenty single a.c. synchronous motored clocks distributed throughout his offices. He now wishes to install some corrective device which will advance the clocks to correct time, after an interruption in current. How may such a system be equipped to accomplish the result desired?*—M.C.

A. The corrective feature desired be provided in several ways—first, by the so-called high frequency method; second, by a motor-generator and a storage battery; third, by an emergency stand-by unit.

By the first method, when an interruption of current occurs, all clocks stop. When the normal current supply returns, a higher than normal frequency generator is automatically or manually connected into the circuit, and causes the clocks to "step-up" at a higher than normal rate of speed until the correct time has been reached.

By the second method, when an interruption of current occurs, a motor-generator of a standard type is automatically operated by a storage battery. The alternator or a.c. generator of this motor-generator set, continues to supply the clock circuit with alternating current at the proper frequency, and as a result there is no loss of time. When the normal current supply returns, the motor-generator set is automatically disconnected from the clock circuit.

By the third method, when an interruption occurs, a hydro-electric generator or gas-electric generator is automatically connected, so that its alternator continues to supply current to the clock circuit without interruption.

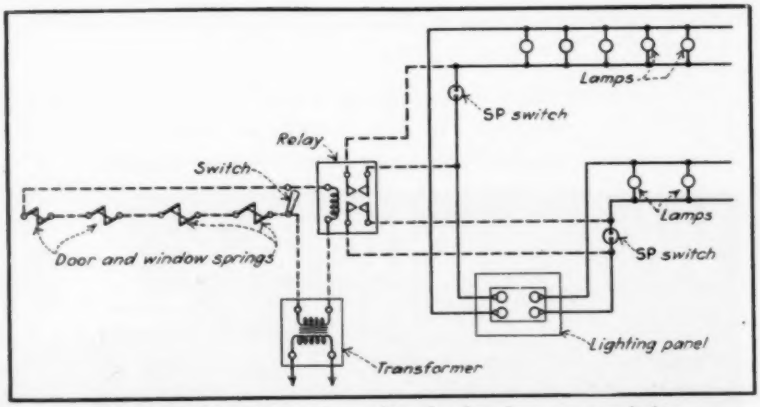
Of the three methods described, the stand-by system seems to be the most efficient. Also, it practically eliminates maintenance expense.

Burglar Alarm Interconnected with Lighting

Q. *Our clients have requested us to install a closed-circuit burglar alarm system in a residence. They wish it to turn on lights in master bedroom and butler's room in case of an alarm. How can such a system be wired?*—L.H.W.

A. The connection of the closed-circuit burglar alarm portion of the system should be in series, that is, all door and window springs and the coil of the relay are connected in a loop. The relay should be of the two-circuit locking type, so that each of the two rooms may be isolated, and whenever necessary may be tested.

The following wiring diagram shows the necessary connections to be made to operate the system as desired. The alarm system is shown in dotted lines. The assumed lighting system is shown in solid lines. The lamps are extinguished after an alarm, by manually restoring the relay to its original position. A switch may be inserted in the alarm circuit during the daytime.



PROTECTION—Diagram for making burglar alarm turn on lights.

Trumbull Presents A New MOTOR STARTER BULLETIN

IT HELPS TO TAKE THE MYSTERY OUT OF STARTERS

It not always has been easy to make the proper selection of the most satisfactory and economical starter for each particular application of motor control, but this publication surely provides the clearest method we have yet seen.

Everyone who specifies, buys or uses motor starters should have a copy of Bulletin No. 148.

Descriptions that are not too technical, photographs, charts, tables of Engineering Data and a complete listing of all standard types of Trumbull Manual and Magnetic Motor Starters, Contactors and Combination Starters make this, perhaps, the most comprehensive bulletin in its field.

If your problem is the selection of a starter for a particular duty, you will discover the type you need by referring first to a comparative chart. Then turning to a designated page, you will find the complete details as to rating, protective features, exclusive Trumbull refinements of design, and cost. Whether it is an inexpensive MANUAL Starter or the most modern MAGNETIC with maximum protective features you may be sure of obtaining the control you require for motors rated from fractional to 50 H.P.

Bulletin No. 148 is new in conception, easy to read and a valuable reference for motor control equipment.

FREE COPY ON REQUEST TO THOSE INTERESTED

The TRUMBULL ELECTRIC MFG. CO.

PLAINVILLE CONNECTICUT

York • Chicago • Boston • Detroit • Louisville • Atlanta • Philadelphia • Ludlow, Ky. • San Francisco, Cal. • Los Angeles, Cal. • Seattle, Wash.

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Our Candid Camera at the N.I.S.A. Convention

1 SUNNY SMILE—*Among the Southern group the camera caught J. Howard Lott, Orlando, Fla. (left); A. F. Anderson, Nashville; J. Arthur Turner, Tampa, and G. G. Johnson of Staunton, Va.*

2 THE WORKS—*General chairman of the convention committee was C. A. Sievert, Chicago, and what a chairman—what a committee!*

3 BANQUETEERS—*President E. C. W. Johnson sings his swan song, after which followed a mighty ovation and the presentation of a handsome travelling bag. He more than deserved it.*

4 THE GREETERS—*Registrants were met by the executive secretary of Chicago's shop association, P. H. Guion, his charming lady helpers, and an efficient corps of local committeemen.*

5 NORTHERNERS COME DOWN—*George P. Svendson (left) Minneapolis, discusses "D²L" winding calculations with J. M. Pilmer of Des Moines, new exec. committeeman, and F. M. Mielke of Duluth, Minn.*

6 BREAKFAST CONFEREES—*Shop methods discussions and orange juice mix quite well when George F. Stratton of Charlotte, N. C., Arthur L. Brown of Worcester, Mass., and Wm. C. Krauth of Louisville get an early morning start.*

7 TAKING NOTES—*C. H. Scheidt of Baltimore (in foreground) joins others in viewing photo displays of shop equipment.*

8 SEVENTH INNING—*President Johnson (left) and treasurer Brown of Worcester, Mass., are happy about the 29-state turnout, while taking a stretch during a first-day intermission.*

9 NEAR NEIGHBORS—*From Milwaukee came (10) H. H. Tholen, chairman of the NECA Motor Shop section, (9) George Andrae of Herman Andrae Electric Co., and more.*

10

High Lights IN THE NEWS

NEW CODE FOR LOS ANGELES

Los Angeles has a new Electrical Wiring Code prepared by an industry Central Planning and Coordinating Committee. It has just been submitted to the Board of Building and Safety Commissioners. It embodies some new circuiting ideas, new load factor allowances for heating, air conditioning and cooking devices, to permit the use of smaller conductors and switches, and the modification of unreasonably severe requirements in residential occupancies not under the authority of State Safety Orders.

The coming of Boulder Dam power made is desirable to clear up accumulated ambiguity and confusion. The previous code became effective in 1934, after two years preparation. Prior to that time, an ordinance prepared in 1917 had been burdened with numerous supplementary rules and interpretations.

A committee of the Electrical Development League consisting of J. W. Rose, electrical engineer, Department of Water and Power; L. H. Ellett, master electrician; and Arthur Kempston, sales engineer, National Electrical Products Corp., prepared the new ordinance.

MUNGER TO AID CO-OP LOAD BUILDING

George D. Munger, formerly head of the local contractors association in Poughkeepsie, has been made Director of the Utilization Division of the Rural Electrification Administration. His job will be to help the cooperatives and others to whom REA money has been loaned, to build up load for their new farm lines.

As a further step in this direction, John M. Carmody, Administrator, says rural power developments may appoint a temporary project manager, before the lines are built, and charge his salary against the loan, until the line is completed and in operation. He will assist customers with the wiring of their premises and the installation of equipment and get load onto the lines.

Mr. Munger resigned from the Central Hudson Gas and Electric Company to enter the government service, as sales manager of the Tennessee Valley Authority. Later he was commercial manager of

GEORGE D. MUNGER—Director of the Utilization Division of REA

the Electric Home and Farm Authority. His Utilization Division of REA will keep a staff of men in the field, to help the cooperatives build load, so they can pay their way.

STATE LEGISLATION AFFECTING CONTRACTORS

Bills affecting the electrical industry have been introduced in 19 state legislatures so far this year. NEMA has made a study of them and reports, as of April 15, that 36 bills have been set in motion. They have to do, for the most part, with licensing of contractors and journeymen, inspection of installations and limiting the sale of appliances and materials, to conform with various approved standards.

Up to that time 44 state legislatures had met, of which 22 had already adjourned. Two more were still to meet. But so far, only two of these proposed laws had been enacted. The general character and status of these bills were as follows, on the date of this report—

Colorado—To regulate wiring and apparatus—In committee.

Connecticut—To license electrical contractors—Killed.

Georgia—To provide electrical inspection in Atlanta (Fulton County)—Approved.

Maryland—1. To license master electricians—In committee. 2. To license electricians in Prince George County—Passed.

Minnesota—To amend law on state electrical boards—In committee.

Missouri—To regulate electrical products—Reported unfavorably.

New Hampshire—1. To prohibit radio interference—Killed. 2. To license electricians—In committee.

New Jersey—To license electricians and inspect wiring—In committee.

New York—To amend license law—In committee.

North Carolina—To license electrical contractors and provide inspection—Enacted.

Ohio—To license electrical contractors and journeymen—In committee.

Oregon—To license electricians—Passed in House, killed in Senate.

Pennsylvania—1. To control sale of electrical devices—In committee. 2. To provide inspection—In committee. 3. To prohibit radio interference—In committee.

Rhode Island—To license electricians—In committee.

South Dakota—To license electricians and contractors—In committee.

Texas—To regulate sale of electrical products—In committee.

Utah—To license contractors and establish code—Killed in House.

Washington—1. To license contractors—In third reading. 2. To license electrical dealers—Killed in Senate. 3. To establish state safety code—Approved.

Wisconsin—To license electricians—In committee.

Nine states this year have also considered bills to prohibit electric and gas utility companies from merchandising appliances, as follows—

Connecticut—In committee.
Massachusetts—Killed.
Michigan—In committee.
New Hampshire—Killed.
New York—Killed.
Ohio—In committee.
Pennsylvania—In committee.
Texas—In committee.
Wisconsin—In committee.

So far no such legislation has been actually enacted in any state but Kansas and Oklahoma, both in 1931. The Kansas law was declared unconstitutional in 1933. Meanwhile, says NEMA, "sentiment in the industry has grown steadily in favor of cooperation by power companies and local dealers in market development, and united opposition to this unnecessary legislation has prevented the enactment of further restrictive laws."

NEMA has also prepared a digest of Fair Trade Laws, so far enacted in 33 states. Both these reports can be secured by writing to the Regulatory Legislation Department, National Electrical Manufacturers Association, 155 East 44th Street, New York.

NEMA PROGRAM TO HOME EDITORS

The home economics editors and writers of ten nationally known publications catering to the American housewife recently conferred at NEMA headquarters in connection with the National Adequate Wiring Program. In the discussion the following points were outlined:

1. The plan, of the NEMA Adequate Wiring Promotion Committee, in cooperation with representatives of other industry

UMI

High Lights IN THE NEWS

[FROM PAGE 87]

associations having similar interests.

2. The proposed operation, under the National Adequate Wiring Bureau.

3. Proposed local bureaus.

4. The National Plan Book and the promotional advertising which will support the program.

5. The National Specification, and the procedure to be used in adapting it to local conditions.

6. The certification feature of the plan.

Present at this April 26 meeting were representatives of Parents' Magazine, Woman's Home Companion, McCall's, Herald-Tribune Home Institute, American Home, Good Housekeeping Institute, Ladies Home Journal, The Country Home, Buildings and Building Management, and home economists of the Graybar Electric Co., and the Consolidated Edison Co. of New York, Inc. All recognized the vital importance of correcting the present inadequacy of wiring in the home.

MEET OUR NEW MIDDLE WEST EDITOR

From now on there will be another editor roving around for *Electrical Contracting*. William T. Stuart is his name. In his little blue Ford, he will be rambling from Ohio to Nebraska and up and down the broad valley, calling on contractors, motor shops and factory electricians, seeking ideas and news and enjoying the broadening influence of travel.

Stuart started in the contracting business in Rochester, N. Y., in 1925, with the Wheeler Green Electric Company. F. A. Mott was general manager then and took a liking to the boy and put him through the mill. He had a turn in the drafting room, motor shop, fixture department, stock room. They put him on accounting, cost keeping. He became a journeyman, a foreman, an estimator. Then Wheeler-Green split up and Mott started on his own, and took Stuart with him. That's what he had been training him for. During the depression, Bill became assistant superintendent for the Vanderlinde Electric Company, also in Rochester.

"BILL" STUART—Our New Middle West Editor, with his little note book.

Now he is our Middle West Editor. He ought to be good. He has made a number of independent labor cost studies. He has introduced several original superintending methods. He likes to write. His hobby is taking pictures. He wants to live in Chicago. And there he'll be—when he is not rolling the road. But most of the time he will spend visiting around, digging up the good stuff and passing it along.

REA LOANS TO BUILD LINES

More loans to build rural power lines have been reported by the Rural Electrification Administration as follows—

Minnesota, Watonwan County—$210,000 to the South Central Electric Association, of St. James, to build 210 miles, to serve 630 customers, in six counties.

Minnesota, Faribault County—$40,000 to the Wells Electric Association, of Wells, to build 42 miles. to serve 123 customers.

Texas, Bell County—An additional $9,500 to the Bartlett Community Light & Power Company, of Bartlett, a total of $45,500 to build 60 miles, to serve 163 customers in two counties.

Indiana, Wayne County—$75,000 to the Wayne County Rural Electric Membership Corporation, of Richmond, to build 70 miles, to serve 225 customers, in three counties.

Indiana, Noble County—$75,000 to the Noble County Rural Electric Membership Corporation, of Albion, to build 65.7 miles, to serve 255 customers, in six counties.

Montana, Cascade County—$100,000 to the Sun River Electrification Association, of Simms, to build 105.7 miles, to serve 345 customers, in two counties.

Washington, Spokane County—$455,000 to the Inland Empire Rural Electrification, Inc., of St. John, to build 463 miles, to serve 1530 customers, in four counties.

California, Modoc County—$500,000 to the Surprise Valley Electrification Corporation, of Alturus, to build 344 miles, to serve 809 customers, in three counties.

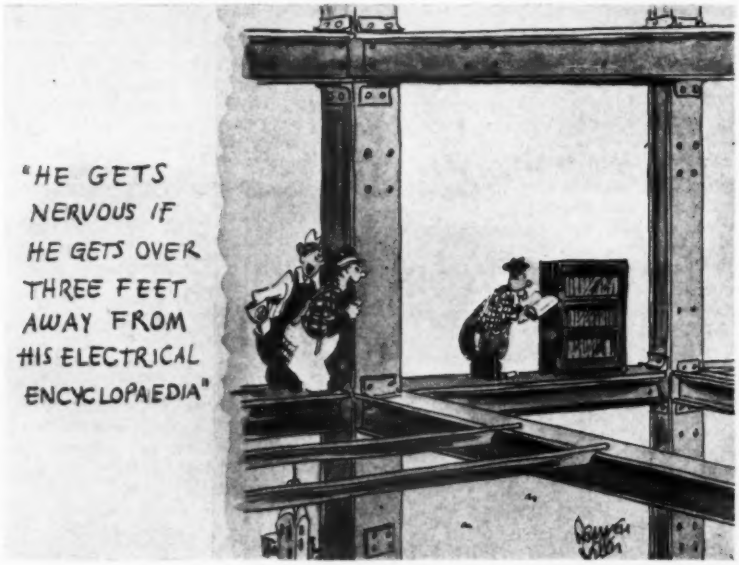
Georgia, Crisp County—$25,000 to the Crisp Farmers Co-operative Corporation, of Gordele, to build 48 miles, to serve 120 customers.

Minnesota, Scott County—$137,000 to the Minnesota Valley Electric Cooperative, of Jordan, to build 141 miles, to serve 445 customers, in seven counties.

Minnesota, Dakota County—$200,000 to the Dakota County Electric Cooperative, of Farmington, to build 205 miles, to serve 600 customers, in four counties.

Minnesota, Brown County—$166,500 to the Brown County Rural Electrical Association, of Sleepy Eye, to build 166 miles, to serve 412 customers, in eight counties.

New Jersey, Sussex County—$132,000 to the Sussex Rural Electric Cooperative, of Sussex, to build 128.2 miles, to serve 446 customers.



EHRLICH STEPS UP

Friends of Howard Ehrlich, publisher of this paper since 1928, will be interested in the news that he has been elected executive vice-president of the McGraw-Hill Publishing Company. He has been a vice-president and publishing head of its six electrical publications since June 1934. He was formerly president of Electrical Trade Publishing Company, of Chicago, which he established in 1920.

BUFFALO BEGINS PRACTICAL-TALK SERIES

A new idea to stimulate attendance at meetings is being used in Buffalo, by the Electrical League of the Niagara Frontier. A series of meetings for electrical superintendents, maintenance and construction men has been started, where practical talks are given that deal with common electrical operating problems in factories.

The first meeting was held on the eve-

"TO HELP YOU SELL . . .

We're aiming 'COLD TURKEY' advertising right at YOUR PROSPECTS

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

A Message to YOU from Westinghouse:

COLD-TURKEY Selling Gets Orders. You'll agree that in this business of selling and installing electrical equipment, in the long run you've got to go out and make the calls to get the orders.

We believe in "cold turkey" selling -- BUT we believe that prospects should be sold as much as possible with advertising beforehand. Here are some Nofuse Circuit Breaker ads that are reaching more than 40,000 factory managers and production men in all industries. Every ad stresses SAFETY and SAVINGS. They tell their stories with dramatic situations you might find in any shop anywhere.

The record proves that the Westinghouse Nofuse Circuit Breaker is a "natural" for an effective door-crashing "cold turkey" approach. There aren't many men in industry who will turn a proposition down flat and cold when the whole approach is built around proved SAVINGS and proved SAFETY that offer him a logical, reasonable way to increase his profits or reduce his costs.

These ads were planned and written to help you sell your customers on NOFUZE safety and savings. They'll reach hundreds of men who buy right in your own locality. They'll build up interest in Nofuse circuit protection, and help you to get the ball rolling toward SALES. Our electrical wholesalers have complete details and proof on how Nofuse Circuit Breakers save. Call them up now.

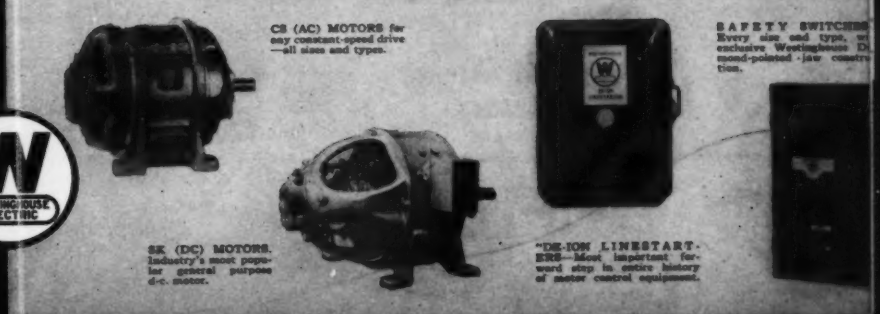
Sincerely yours,

Westinghouse Electric & Mfg. Co.

NOFUZE "DE-ION" CIRCUIT BREAKERS 100% Safety PLUS Important Savings

Every House needs Westinghouse

FROM INCOMING LINE TO DRIVEN MACHINE
Install Westinghouse


CS (AC) MOTORS for any constant-speed drive —all sizes and types.
SAFETY SWITCHES Every size and type, ... exclusive Westinghouse D... mond-pointed ·jaw constru... tion.
SK (DC) MOTORS. Industry's most popular general purpose d-c. motor.
"DE-ION LINESTARTER—Most important forward step in entire history of motor control equipment.

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MICA
in its most
usable form
is called

MICABOND

This super insulation has all the desirable characteristics of natural mica plus *workability*. You can bend, punch, shear and form Micabond with ease and accuracy. It has high mechanical strength, high dielectric strength, heat resistance, low surface leakage, and is unaffected by moisture or dilute acids.

Whenever the job calls for molding, segment or heater plate, flexible sheets, tubing, tape or formed parts, you can do it better with Micabond. Samples furnished on request.

CONTINENTAL-DIAMOND FIBRE COMPANY
NEWARK, DELAWARE

High Lights IN THE NEWS

[FROM PAGE 88]

ning of May 21. Speakers were E. G. Brandt, Westinghouse Elec. & Mfg. Co. and H. B. Smith of Underwriters' Laboratories, New York.

These meetings are announced by invitations, with which are enclosed novel gummed tear-off reminder stickers. These reminders are placed on calendars, diaries or note books and state the time, date and place of the next meeting.

LICENSE FOR CLEVELAND

Cleveland, Ohio, is setting up its new licensing system to become effective August 16. The Electrical Board of Review has already been appointed. Walter McCornack, architect, is the chairman and Sidney W. Watkins, engineer, is the secretary.

The first task of the new board will be to establish a licensing method and examinations for electrical contractors. Copies of the new electrical code will be distributed to the trade.

STEPPED-UP LAMPS TO EARN MILLIONS

New high-efficiency lamp filaments have been announced by Nela Park that, it is estimated, will provide a "lighting bonus" of $16,500,000 to the public this year. The new tungsten filament is said to increase the light output of incandescent lamps by ten per cent without using any additional current. The 60-watt lamp, when equipped with this new filament also shows greatly improved maintenance efficiency throughout its active burning life.

Standard 60-watt lamps are being made at this time in the several common lighting voltages. This development will soon be applied to other lamps in the standard line, and without any increase in prices.

The new concentrated filament of tungsten is first a straight wire 19/10,000 in. thick. It is then wound 335 turns to the inch around a thin molybdenum wire or mandrel. The coil turns are kept 1/1000th in. apart. These coiled lengths are again coiled 70 turns per inch, making the original 20-in. filament finally $\frac{5}{8}$ in. long. The new filament works in a bulb filled with a mixture of nitrogen and argon gas.

BEWARE OF PHOTOGRAPH RACKET

Should you receive a telephone call or a visit from anyone who claims to be a photographer, engaged by Electrical Contracting or the McGraw-Hill Publishing Company, to take your personal photograph, do not be misled. Electrical Contracting does not secure photographs of individuals in this way. It is a racket. Turn it down.

COMING MEETINGS

Edison Electric Institute—Annual meeting, Chicago, June 1-4.

National Electrical Contractors Association—Executive Committee Meeting, Chicago, June 7-9.

Ontario Electrical Contractors Association—Convention, Windsor, Ont., June 14-15.

American Institute of Electrical Engineers—Summer convention, Milwaukee, Wis., June 21-25.

Canadian Electrical Association—Annual convention, Banff Springs Hotel, Banff, Alberta, June 21-24.

New York Association of Electrical Contractors & Dealers, Inc.—Higby Club, Big Moose, N. Y., June 21-24.

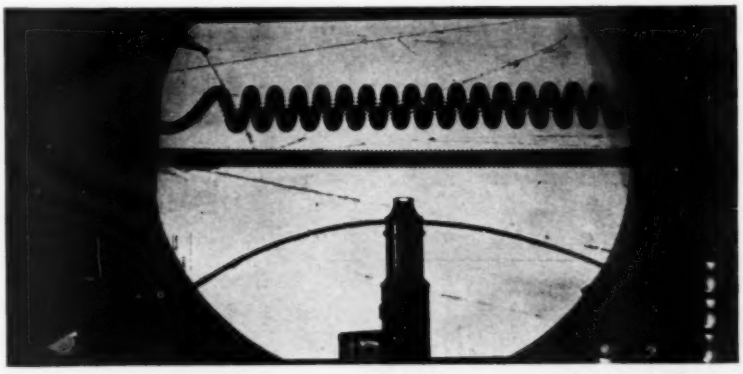
Associated Municipal Signal Services — Annual Convention, Elizabeth, N. J., June 28-30.

International Association of Electrical Inspectors — Southwestern-Northwestern Sections (Joint Meeting) Salt Lake City, Utah, August 23-25.

Eastern Section, Hartford, Conn., Sept. 20-22.

Southern Section, Atlanta, Ga., Week of October 4.

National Electrical Contractors Association — Annual convention, Biltmore Hotel, Los Angeles, Calif., October 18-21.



HAIR AND COILS—Coils of new high efficiency tungsten filament enlarged and silhouetted beside curved strand of human hair.

To Insure
Low Installation Costs
use

APPLETON NO-THREAD MALLEABLE UNILETS

APPLETON No-Thread Unilets save time and money, because they are so easy to install. And after they're installed, they will last a lifetime, insuring low maintenance costs.

Insert the conduit—tighten the nut—the job's done. Naturally, workmen like to use them. In tight corners and cramped working space, they're easy to install.

Made of malleable iron, finished with cadmium, Appleton No-Thread Unilets resist corrosion and rust. Strong and light, yet constant vibration and hammering doesn't harm them.

There is a size and type of Appleton No-Thread Malleable Unilet for any job. Send for free catalog.

Sold through Wholesalers

APPLETON ELECTRIC COMPANY

1704 Wellington Avenue Chicago, U. S. A.

New York—76 Ninth Avenue
San Francisco—655 Minna St.
Los Angeles—340 Azusa Street
Detroit—7310 Woodward Avenue
St. Louis—420 Frisco Building
Atlanta—203 Luckie St., N. W.

APPLETON

No-Thread Malleable

The Original Threadless Conduit Fittings **UNILETS**

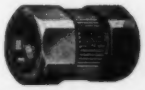
Reg. U. S. Pat. Off.

There is an Appleton No-Thread Malleable Unilet for Every Job.

Type "T" No-Thread Unilet

Type "C" No-Thread Unilet

Type "LL" No-Thread Unilet



No-Thread Coupling

In

ELECTRICAL CONTRACTING

for July

"ELECTRICAL FEATURES *of the New* **MELLON INSTITUTE"**

"Super-adequacy" wiring in the finest structure of its kind ever erected, after seven years in construction, at a cost of between seven and eight million dollars. Only one job like this in a decade, but there are many interesting and unusual features applicable elsewhere. And it makes good reading!

Also

Editorial Feature Section

"EXPLOSION PROOF WIRING"

A whole section devoted to this all-important subject, including a complete list of what to use and who makes it. Valuable file material.

MANUFACTURERS:

Don't miss this important issue. Final closing, for complete copy and plates, June 20th.

ELECTRICAL CONTRACTING

330 W. 42 St., New York, N. Y.

More GOSSIP

Emergency Light

An emergency lighting system was installed in Erie, Pa., by the Keystone Electric Co. It is so connected with 3-way and 4-way local switches that various important lights go on automatically if the normal current supply fails. This takes place even though these lights are actually switched off from the normal supply at the time of the outage.

CITY FATHER—in addition to having served as secretary of the local association, Vernon M. Miller of the Miller-Liskey Electric Co. took office on April 1st as a member of the Hagerstown, Md. city council. Now he's all set to work for better laws and ordinances related to electrical safety in that city. Vernon knows what it is all about, having spent 33 years in the trade.

Emergency Power

When Louisville's flood shut down all electrical service, the Wm. C. Krauth Electric Co. had a perfectly dry service shop, but no gas for its oven nor power for the machinery. A 2½ k.w. d.c. generator was belted to the jacked-up wheel of a marooned truck. This provided work lights and also permitted one-at-a-time operation of an air compressor, lathe and other necessary machines for which some old d.c. motors were available. A small 500-volt generator was rigged up for providing higher voltage tests on reconditioned apparatus.

Sprayed Metal

Getting the hang of building up motor shafts by the metal spray process has brought considerable work of this nature to C. S. Ballantine, service shop operator of Augusta, Ga.

Pictures Tell

To prove that his company does its bit in selling ventilation apparatus, H. K. Jaeger of the Robertson Electric Construction Co. picks up a recent catalog of Buffalo Forge Co. In it are pictures of a number of recent Buffalo installations made by his company.

Paying Tool Investment

Out in Ohio, some electrical contractors were recently discussing new trends in tooling up for line construction work. They sought a possible approach to the rural electrification transmission line business.

One man cited his personal checkup of production on a transmission line, for which a power company used a $14,000 power driven pole-hole digger. He reported that a crew of seven men recently set 57 poles 40-ft. high in an 8-hr. day.

2-Amp. Bus Ride

Should you happen to stand on Broad Street in Newark some day and notice an approaching bus bearing a sign "2 Ampere", don't be alarmed about that last malted milk you had with your hamburger. The sign designates bus route No. 2, which takes you to the nearby city of Ampere, N. J.

Eastward Ho!

They say, you can take a boy out of the mountains but not the mountains out of the boy. So when H. S. Hughes left the Black Hills of South Dakota to attend Chicago University, the call of mountain scenery resulted in his finally settling down in scenic Cumberland, Md. He has operated the Electric Service Co. there since 1933.

Tax Dilemma

Contractors sometimes scoff over taxes being important in overhead. They will gain genuine enlightenment if they can catch E. F. Beckmeyer of the Beckmeyer-Davis Company of Huntington, W. Va., in a statistical mood. Mr. Beckmeyer begs to inform his fellow-sufferers of the following inescapable items: unemployment—2 per cent of payroll; old age—1 per cent of payroll; gross sales tax (state)—2 per cent of total sales; sales tax (city)—½ per cent of total sales; state compensation—1.42 per cent of payroll; city and county general taxes—approximately 1 per cent of sales. Altogether 7 to 8 per cent of billings must be paid in taxes, yet local jobs are taken now and then on a flat 10 per cent cost—plus basis. Aah!Waa!

More GOSSIP

Hospital Modernization

Perhaps no type of modernization is more timely than one which is just beginning in a large hospital in Erie, Pa. Here Jack O'Brien, of the Northwest Electric Construction Co., is installing a complete emergency lighting and elevator power system, with fire alarms, and nurses' calls. And the wiring must be done concealed on all upper floors, while the hospital is in operation.

Only the Best

The dignified store and office arrangement that surrounds visitors to the Schermerhorn Electric Co. at Richmond, Va., should certainly make them feel aware of getting the best of quality. This is evidently so, from the fact that this company keeps busy with high grade time-and-material work in homes and stores of that city.

MORE MERCURYS—Here is Frank J. Steeve, of the Crescent Engineering Company, Chicago, supervising the installation of 244 high efficiency mercury vapor lamps at the new plant of the Tuthill Pump Company, Chicago. Fifty more of these lamps will be installed later in an additional wing. This is Chicago's largest installation of the new type high efficiency mercury lamps, 96 foot candles on the machines.

Explosion Proof

A petroleum plant job recently completed in Illinois by the Hatfield Electric Co., of Cleveland ran up $45,000 in labor on explosion-proof wiring. Because of the number of panelboards and control devices, located in hazardous areas, E. E. Ismond says, the labor amounted to only one-fourth of the total job cost. One important operation that piled up extra labor was the accurate alignment and butting of conduits to provide proper connections at all unions.

YOU WOULD SAY—"GIVE ME A FLAT BOTTOM BOAT"

. . . AND CONTRACTORS ARE SAYING . . . "GIVE US FLAT BOTTOMED KILLARK FITTINGS"

• Included in the Killark line are fittings that find an increasingly wide application in contracting work. These fittings, including flush switch fittings, vaporproof light fittings and explosion-proof fittings for hazardous locations, are lighter in weight, have greater strength, and are designed for faster installation. Send for bulletin and complete details.

KILLARK ELEC. MFG. CO.

3940 EASTON AVENUE, ST. LOUIS, MO.

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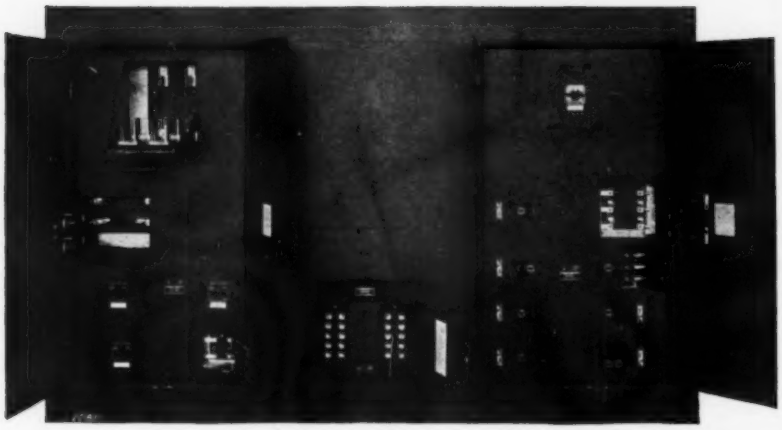

Fuse-Switch Type of Feeder Distribution Panelboard

FA COMPLETE DEPENDABLE BIDS

There's Definite Value in this FA Service

When you want dependable bids on Panelboard or Switchboard jobs, you get them *complete and on time* — when you take advantage of this service which FA has been giving to Electrical Contractors for many years.

In addition, and of equal importance, Contractors can always depend on FA for:

Deliveries when material is required on the job.

Standardized unit construction that always assures an accurate fit of all component parts.

Standard Panelboards to meet any standard requirements.

Special design Panelboards to meet any special requirements.

Definitely identify yourself as a quality Contractor with the visible FA quality trade-mark.

EASY PRICING WITH NEW CATALOG

Because the new FA Catalog No. 56 is intelligently arranged and contains necessary engineering, reference, dimensional, and pricing data — it is especially valuable since it enables you to easily figure correct prices on all types of standardized Panelboards. . . . Send for copy.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

More GOSSIP

Doubly Handicapped

Flood damage repairs came fast and furious for the Quinlan Electric Company at Huntington, W. Va. Then to top it all off, the company's quarters were located on the ground floor in an Arcade building in the flooded zone. A vacant fourth floor office was quickly re-vamped as a temporary base for day-and-night operations. Which is another way of saying you can't keep Quinlan down.

Light for Ponies

Night racing calls for floodlighting the half-mile race track of the Philippine Racing Club, Manila, Philippine Islands, where plans are now under way to install 140 1000-watt floodlights. To increase efficiency, a six-foot white-washed wall will be constructed around the outside of the track to reflect the light.

GOODWILL TROPHIES: — Twice each summer the golfing contractors of Detroit and Toledo cross drivers and niblicks for possession of the covetted trophy at the right. Made water-tight and corrosion resistive, it's RLM contour is filled with cheer to overflowing at the famous 19th hole. Appearing at the left, is a token of golf supremacy, for which the Detroit wholesalers tangle annually with the local contractors. Picture posed in the office of C. C. Cadwallader, manager of the Detroit Electrical Contractors Association.

Extra Unions

A recent explosion-proof wiring job in Buffalo, that ran about $100,000, brought some important experience to F. I. Sigman of McCarthy Bros. & Ford. He hit upon the trick of providing extra unions at important points in the system, as the conduit is installed. Then if changes must be made later on, the work of cutting into the system is greatly simplified.

The Conduit That Never Fights Back

Youngstown Buckeye Conduit is like an extra helper on the job. Uniformly ductile, foot for foot, it will take a bend from the hickey without argument—and stay put. When the whole job is finally laid up, it will have that workmanlike appearance that owners rightly judge by.

Youngstown Buckeye Conduit is manufactured throughout by one organization. From the ore in the earth to the satin-smooth lacquer lining in the finished product, there is absolute control which allows no variations.

Clean threads, full cut, require no chasing. Uniform ductility and tensile strength make uniform bends possible, and without a flattening on the inside of the radius. The lacquer lining is as ductile as the metal, and so bends smoothly, with no flakes left to snag wires.

Bid on Youngstown, buy Youngstown—and know you will be backed up by a product that works with you for a better job and more certain profit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels • **GENERAL OFFICES** • **YOUNGSTOWN, OHIO**

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YOUNGSTOWN

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"If NECA Chapters will accept code assignments and appoint their committees to study the 1937 code and develop suggestions for its improvement, based upon experience of members of their Chapter, their suggestions could be referred to the NECA representatives assigned to particular Article Committees, through whom such recommendations can be given consideration.

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29. Bulletin 5601 and 5602, describing electronic automatic alternator voltage regulator Types EB and EF. Ward Leonard Electric Company.

"3-in-1" CLEANERS

30. Bulletin describing a new line of super-power Ideal "3-in-1" cleaners for vacuuming, blowing and spraying. Ideal Commutator Dresser Co.

PRESSURE AND VACUUM SWITCHES

31. Bulletin GEA-821F describing pressure and vacuum switches, CR2927, diaphragm type, designed to open or close contacts on changes of pressure or vacuum of any gas or liquid. General Electric Co.

CONTROL EQUIPMENT

32. A loose-leaf catalog featuring automatic control equipment for electric motors. Includes overload calibration scale, fuses, switches, magnetic overload relay and starters. Rowan Controller Co.

RADIO EQUIPMENT PROTECTION

33. A folder entitled "Radio Equipment Protection" shows how tubes, transformers, condensers and other equipment may be safeguarded. Describes Re-Cirk-It combination switch and circuit breaker. Heinemann Electric Co.

PULLEYS & FLEXIBLE COUPLINGS

34. A catalog listing the Congress line of "V" grooved pulleys; variable speed pulleys, step-cone pulleys and flexible couplings. Congress Tool & Die Co.

LIGHTING FIXTURES

35. A 76 page catalog consisting of sections on residential, lumiline, brass chrome, china-brass and china fixtures. Also price list. Efcolite Corporation.

CUTOUTS, FUSES, SWITCHES

36. Price list No. 138, covering Connecticut "A-1" devices. Includes plug cutouts, entrance switches, fuse blocks, telephone and battery switches, outlet box receptacles. Connecticut Electric Mfg. Co.

MULTIPOLE MIDGET RELAYS

37. Bulletin P-200, features Type CX2132 multipole midget relay. Gives specifications, prices. Struthers Dunn, Inc.

INDUSTRIAL SAFETY EQUIPMENT

38. Catalog No. 5-C covering 80 pages of details on safety equipment and first aid materials. Includes many illustrations. Mine Safety Appliances Co.

EXPANSION BOLTS

39. A 31-page catalog listing details, including price list, on expansion shields, toggle bolts and turnbuckles. U. S. Expansion Bolt Co.

UNIT PACKAGE SPLICES

40. A folder featuring the unit package splices for 15 kv. three conductor straighttype cable joint and three single branch type cable joints for 15 kv. single conductor cable. Waterbury Cable Service, Inc.

SOLENOID VALVES

41. Catalog No. 20, consisting of 32 pages on solenoid valves for automatic and remote control. Air, gas, steam and liquids. Automatic Switch Co.

Please note that there is a charge for the following manual. Send for it direct to the Manufacturer.

KITCHEN DESIGN MANUAL

A 50 page manual for dealers and individuals responsible for designing and planning new and remodeled kitchens. Complete electric kitchen layout and dimensions. Edison General Electric Appliance Company, Chicago, Ill. Price 50 cents.

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(Not good after September 1)

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THE UNSEEN HAND

Curtis Lighting Photo

Sturdily built, simple in operation, self-starting, equipped with silver contacts—that's Sangamo Form K Time-Switch.

that makes this installation COMPLETELY AUTOMATIC

Furniture dealers are especially receptive to lighting and wiring modernization. They can be made a source of continued, profitable business for a progressive electrical contractor.

But . . . you must *first* gain their good will. One of the easiest ways to do this, is by selling them a modern Sangamo Time-Switch. Once installed, *this unseen hand* assures dependable, full automatic control for window, sign and flood-lighting. Thus, the time-switch sale will be a stepping stone for additional profitable business for you.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

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28. Bulletin 1500, gives information on instruments for measuring resistance to earth of ground connections and not intended for measuring insulation resistance of insulation grounds. James G. Biddle Co.

VOLTAGE REGULATOR

29. Bulletin 5601 and 5602, describing electronic automatic alternator voltage regulator Types EB and EF. Ward Leonard Electric Company.

"3-in-1" CLEANERS

30. Bulletin describing a new line of super-power Ideal "3-in-1" cleaners for vacuuming, blowing and spraying. Ideal Commutator Dresser Co.

PRESSURE AND VACUUM SWITCHES

31. Bulletin GEA-821F describing pressure and vacuum switches, CR2927, diaphragm type, designed to open or close contacts on changes of pressure or vacuum of any gas or liquid. General Electric Co.

CONTROL EQUIPMENT

32. A loose-leaf catalog featuring automatic control equipment for electric motors. Includes overload calibration scale, fuses, switches, magnetic overload relay and starters. Rowan Controller Co.

RADIO EQUIPMENT PROTECTION

33. A folder entitled "Radio Equipment Protection" shows how tubes, transformers, condensers and other equipment may be safeguarded. Describes Re-Cirk-It combination switch and circuit breaker. Heinemann Electric Co.

PULLEYS & FLEXIBLE COUPLINGS

34. A catalog listing the Congress line of "V" grooved pulleys; variable speed pulleys, step-cone pulleys and flexible couplings. Congress Tool & Die Co.

LIGHTING FIXTURES

35. A 76 page catalog consisting of sections on residential, lumiline, brass chrome, china-brass and china fixtures. Also price list. Efcolite Corporation.

CUTOUTS, FUSES, SWITCHES

36. Price list No. 138, covering Connecticut "A-1" devices. Includes plug cutouts, entrance switches, fuse blocks, telephone and battery switches, outlet box receptacles. Connecticut Electric Mfg. Co.

MULTIPOLE MIDGET RELAYS

37. Bulletin P-200, features Type CX2132 multipole midget relay. Gives specifications, prices. Struthers Dunn, Inc.

INDUSTRIAL SAFETY EQUIPMENT

38. Catalog No. 5-C covering 80 pages of details on safety equipment and first aid materials. Includes many illustrations. Mine Safety Appliances Co.

EXPANSION BOLTS

39. A 31-page catalog listing details, including price list, on expansion shields, toggle bolts and turnbuckles. U. S. Expansion Bolt Co.

UNIT PACKAGE SPLICES

40. A folder featuring the unit package splices for 15 kv. three conductor straighttype cable joint and three single branch type cable joints for 15 kv. single conductor cable. Waterbury Cable Service, Inc.

SOLENOID VALVES

41. Catalog No. 20, consisting of 32 pages on solenoid valves for automatic and remote control. Air, gas, steam and liquids. Automatic Switch Co.

Please note that there is a charge for the following manual. Send for it direct to the Manufacturer.

KITCHEN DESIGN MANUAL

A 50 page manual for dealers and individuals responsible for designing and planning new and remodeled kitchens. Complete electric kitchen layout and dimensions. Edison General Electric Appliance Company, Chicago, Ill. Price 50 cents.

CIRCLE NUMBERS-SIGN-AND MAIL

ELECTRICAL CONTRACTING — **June**
(Not good after September 1)

Please send me, without obligation, manufacturers' literature herein described and identified by numbers circled below.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41

NAME..... TITLE.....

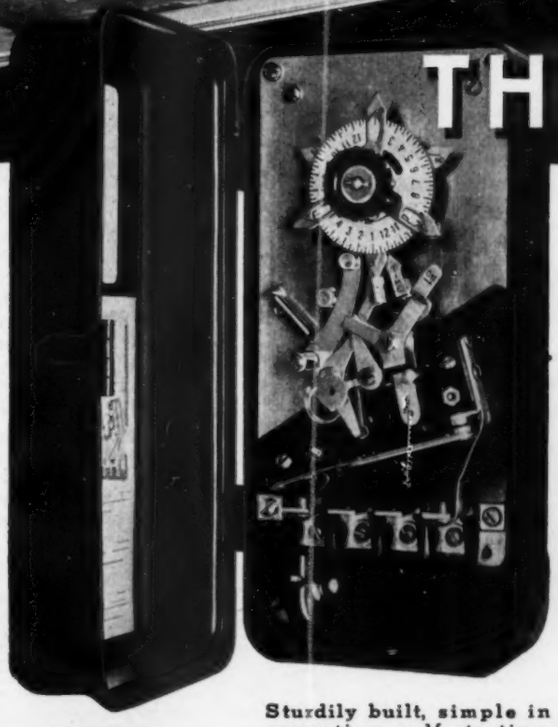
COMPANY .....

ADDRESS .....

CITY ..... STATE .....

THE UNSEEN HAND

Curtis Lighting Photo



Sturdily built, simple in operation, self-starting, equipped with silver contacts—that's Sangamo Form K Time-Switch.

that makes this installation

COMPLETELY AUTOMATIC

Furniture dealers are especially receptive to lighting and wiring modernization. They can be made a source of continued, profitable business for a progressive electrical contractor.

But . . . you must *first* gain their good will. One of the easiest ways to do this, is by selling them a modern Sangamo Time-Switch. Once installed, *this unseen hand* assures dependable, full automatic control for window, sign and flood-lighting. Thus, the time-switch sale will be a stepping stone for additional profitable business for you.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

A *Double Action* SOLDERING PASTE..

....The man on the job will like its double action!

● If you want something especially good in Soldering Paste, try DUTCH BRAND. It simplifies the art of soldering.

It won't flow away, but stays close to the work. Its special chemical properties clean off oxide and dirt leaving a well "scrubbed" surface that will hold the solder evenly... and fast. *It won't corrode!*

It's a double action paste because the actual fluxing ingredients are concentrated. It does double the amount of work and of course that makes it economical.

If you would like to try a real good paste — order a few cans from your jobber.

DUTCH BRAND Friction Tape, Rubber Tape and Soldering Paste are sold by electrical jobbers everywhere.

VAN CLEEF BROS. Est. 1910
Manufacturers
Woodlawn Ave., 77th to 78th Sts., Chicago, U.S.A.

DUTCH BRAND
"Extra Service" Friction Tape
The Nos. 2, 4, 2 and 1 sizes are all available in the well known orange and blue individual and display cartons and metal counter dispensers for retail sale, as well as that popular Jumbo shop package for industrial users.

DUTCH BRAND
Rubber Insulating Tape
Fuses instantly without heat. Molds into one solid piece. It s-t-r-e-t-c-h-e-s without breaking because it contains more live, new rubber. Approved by Underwriters Laboratories.

DUTCH BRAND Friction Tape
EXCEEDS THE QUALITY SPECIFICATIONS OF THE A.S.T.M.

News of NECA

[FROM PAGE 96]

NECA code representatives, in support of or opposition to the proposed revisions of the Article in question, as it appears in the preprint.

"As a rule there is better than 30 days between the receipt of the preprint of Article Committee recommendations and the bi-ennial meeting of the full Electrical Committee, during which information from the local code committees can be assembled by the NECA representatives on the Electrical Committee. This fortifies the NECA representatives with the views of electrical contractors throughout the industry, from actual field experience, and assures broader representation and influence in the development of our National Electrical Code."

NECA Chapters are requested to file with Headquarters the names of the chairmen of Chapter Code Committees and to indicate from time to time phases of code matters in which they are particularly interested. As soon as Article Committee assignments have been announced by the Chairman of the Electrical Committee, N.F.P.A., each local code committee will be advised as to the names of the NECA representatives assigned to each Article Committee. Direct contact may then be made by such local committees with their national representative on specific Article recommendations or inquiries.

WIRING FOR FHA HOMES

NECA has prepared three booklets containing the specifications and layout for electrical wiring in the three types of National Small Homes Demonstration Projects, Houses B, D and E. These are being sponsored by the Federal Housing Administration with the cooperation of the National Lumber Manufacturers Association and other affiliated building groups. These booklets contain complete lists of materials and the basis for estimating installation costs for these projects, with all of the optional wiring methods provided in the FHA specifications for both service entrances and branch circuit wiring.

The design of these houses has had to be kept as simple and inexpensive as possible to come within the requirements of Federal Housing Administration. The objective is low cost housing to meet the purchasing ability of the more than 70 per cent of our population who have annual incomes of less than $2500 per year. There are many desirable additional wiring features which have been omitted under the pressure of FHA's minimum cost requirements. FHA is considering the issuing of supplemental optional features recommended to owners, not included in the minimum requirements for FHA loans on these homes. Electrical contractors figuring on these jobs should point out such omissions to the owners and seek to have them included in the installations.

More than 500 builders throughout the country have already signed up to erect these demonstration homes and it is expected that within a few weeks contracts will have been closed for the erection of the three demonstration houses in 1000 cities and towns. From these it is expected that approximately 45,000 similar homes will be built this year.

Only sufficient copies of the three wiring booklets have been printed by NECA to supply one set to each member of National Electrical Contractors Association. Distribution will be confined to NECA membership.

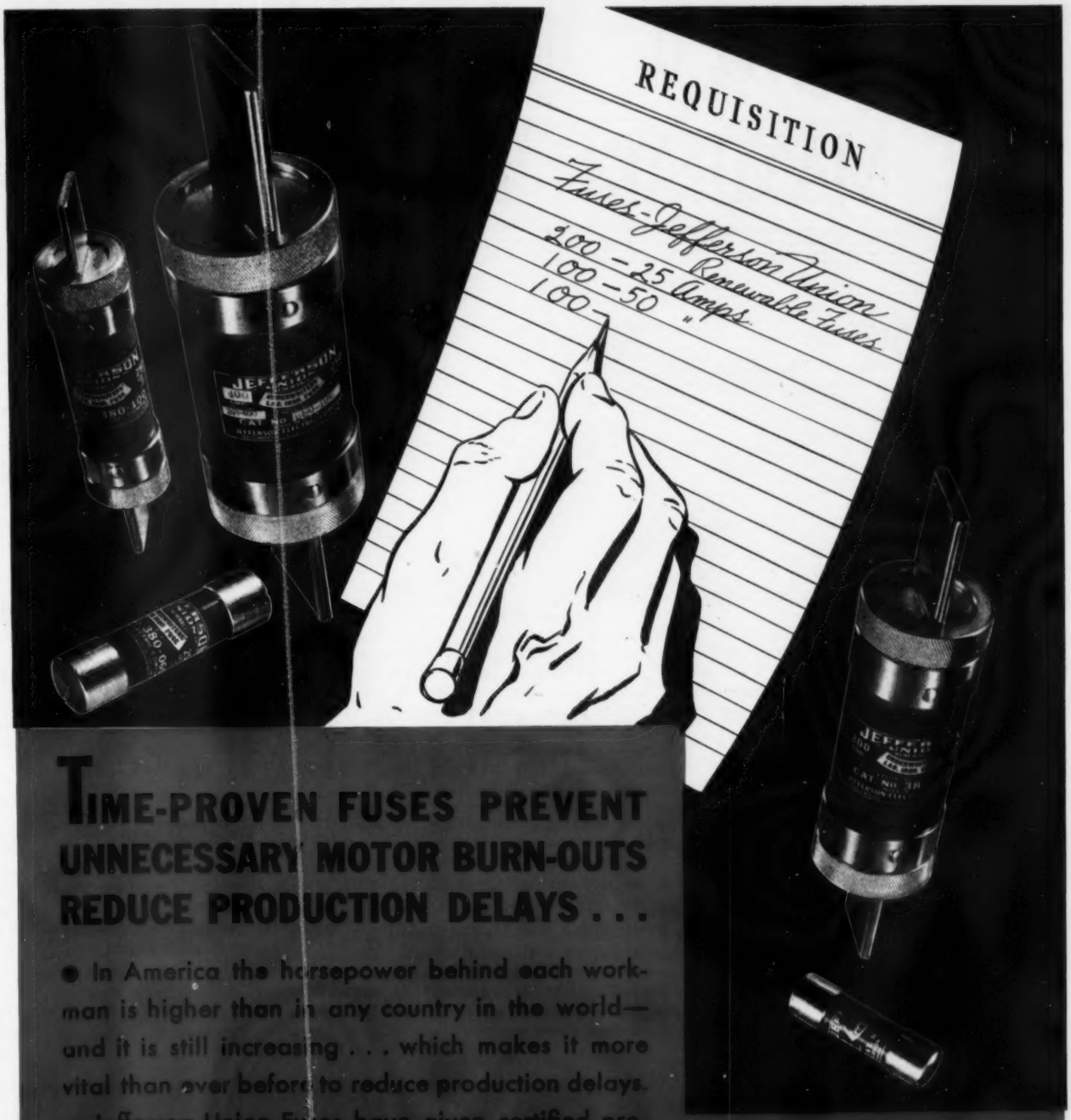
LOOKING 'EM OVER—Charles Fry, of Dayton, Ohio, in the plant of the Standard Register Company, where he is installing a vapor lamp lighting system in the composing room, press room, and copy departments. Cooper-Hewitt lamps are used over composing benches and mercury lamps above the presses. Mr. Fry was president of the Dayton Chapter of the N.E.C.A.

SAFETY CODE COMMITTEE

Earl N. Peak will be the NECA representative on the Sectional Committee, A.S.A., for the revision of the National Electrical Safety Code. This code is primarily concerned with outdoor distribution, substations and power house safety standards.

The Sectional Committee has been organized under the leadership of the National Bureau of Standards. The first meeting of this Committee was held in Washington on May 24th for the formulation of procedure and the assignment of work to sub-committees.

Material for this department is supplied by the headquarters staff of the National Electrical Contractors Association, 420 Lexington Avenue, New York.



TIME-PROVEN FUSES PREVENT UNNECESSARY MOTOR BURN-OUTS REDUCE PRODUCTION DELAYS . . .

● In America the horsepower behind each workman is higher than in any country in the world—and it is still increasing . . . which makes it more vital than ever before to reduce production delays.

Jefferson-Union Fuses have given certified protection to electrical equipment since motors were a factor in manufacturing industries . . . They are time-proven—they prevent unnecessary burn-outs of the motors they protect, and thus prevent the delays so costly in high speed production.

Jefferson-Union Renewable Fuses are simple and rugged—can be renewed in a jiffy.

To be sure—write "Jefferson-Union Renewable Fuses" into your specifications.

JEFFERSON UNION
Renewable
FUSES

JEFFERSON ELECTRIC COMPANY
BELLWOOD (Suburb of Chicago) ILLINOIS
Canadian Factory: 135 College Street, Toronto

With the MANUFACTURERS

U. S. Rubber Promotions

United States Rubber Products, Inc., of New York, has promoted the following men from within its ranks to fill executive positions—

J. E. Power, manager mechanical sales, New York District, transferred to 1790 Broadway as assistant sales manager, Mechanical Goods Division.

R. V. Hilands, manager of Philadelphia and Baltimore District, appointed manager mechanical sales, New York Branch.

A. B. Means of the Philadelphia sales organization to manager mechanical sales, Philadelphia and Baltimore Branches.

R. F. Jackson of the Baltimore sales organization to assistant manager mechanical sales, Baltimore Branch.

E. P. Cole of Denver sales organization to manager mechanical sales, Denver Branch.

•

Charles Rutledge has been made service representative for the Detroit district of the American Foundry Equipment Company of Mishawaka, Ind. His headquarters will be with Hutton H. Haley & Associates, 2918 East Grand Blvd., Detroit.

•

M. H. Rhodes, Inc. has moved its executive and sales departments to larger quarters in the new Pan-American Building, 9 Rockefeller Plaza, New York City.

•

Edmund D. Kennedy, formerly advertising manager of the Hays Corporation, is now with the advertising department of the Copperweld Steel Company of Glassport, Pa. Mr. Kennedy was previously associated with the Westinghouse Electric & Manufacturing Company and the National Electric Company.

•

Mort Duff has been appointed advertising manager of the Wincharger Corporation, Sioux City, Iowa, manufacturers of wind-driven generating equipment for farms.

General Electric Company is erecting a new $700,000 building at Los Angeles. The new six-story building will occupy approximately a city block in the downtown industrial section with 250,000 square feet of floor space. It is planned to complete three stores, for occupancy by September, to house the offices, warehouse and display rooms of the General Electric Company, G-E Supply Corp., G-E Contractors Corp. and G-E Merchandise Department.

•

Lucille L'Hommedieu, receptionist of Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Pa., won first award in the "Why I Like to Work for My Company" contest conducted by Forbes Magazine. The prizes were awarded by B. C. Forbes at a luncheon held in New York recently. Miss L'Hommedieu received $250 in cash. A. W. Robertson, chairman of Westinghouse, accepted the Forbes Magazine silver cup given to the company whose employee won first place in the contest.

•

C. A. Patterson has been appointed sales engineer for the St. Louis–Kansas City territory of Holophane Company, Inc. of New York. He was commercial and industrial lighting engineer for the Alabama Power Company.

Kelvinator Appoints Range Supervisors

Pierre L. Miles, sales manager of the Range and Water Heater Division of Nash-Kelvinator Corporation, Detroit, has appointed the following regional range supervisors—

Harry J. Moeller, Western Region, with offices in Seattle; R. H. Jancke, Western Region, Denver; H. S. Stratton, Eastern Region, Nutley, N. J.; Carl J. Theobald, Central Region, Detroit; Fred A. Ramsdell, Central Region, Glen Ellyn, Ill.; E. C. Sherman, Eastern Region, Sunnyside, L. I.; W. A. Wilson, South Central Region, Kansas City, Mo.; T. L. Craig, Southeastern Region, Birmingham, Ala.; George Eastman, Southeastern Region, Raleigh, N. C.; and C. N. Smith, Western Region, San Francisco, Calif.

•

Linde Air Products Company of New York, unit of Union Carbide and Carbon Corporation announces the opening of a new Linde oxygen plant on Powhattan Ave., Essington, Pa. They have also opened a new Prest-O-Lite acetylene plant at 2330 Armistead Bridge Road, Norfolk, Va.

•

Sangamo Electric Company, Springfield, Ill., opened offices in Chicago on May 1. They are located at 140 South Dearborn Street.

•

Leon C. Hulse has been made factory sales engineer of the air conditioning division of the Gar Wood Industries, Inc. of Detroit, Mich. Mr. Hulse has been connected with the air conditioning division for the past six years.

•

Ilg Electric Ventilating Co., Chicago, has just celebrated its 30th anniversary.

WELDERS' HOLIDAY—Some 400 men comprising engineers, maintenance superintendents, steel erectors and others recently took in a five-day advanced course in arc welding design and practice at Pittsburgh. The course was sponsored by the Lincoln Electric Co. of Cleveland.

INCREASING DEMAND

BUSY INDUSTRY NEEDS YOUR SERVICES

...AND DELTABESTON

Your business is not restricted to new construction. Today, there is an immense market for repairs and replacements. Existing electrical equipment must be in tiptop shape. Motors must provide constant . . . uninterrupted service.

As an electrical contractor, your cue is Deltabeston Magnet Wire. Motors wound with it give above-average performance . . . day after day.

Deltabeston Magnet Wire is insulated with Purified Asbestos. Excessive heat and moisture do not affect its dependability. Overloads . . . more frequent with today's production standards . . . do not damage Deltabeston reliability.

Act now! Write for complete information on Deltabeston Magnet Wire . . . and the complete line of Deltabeston conductors. Address Section Y-886, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

Deltabeston Wire and Cable is distributed by General Electric Merchandise Distributors and Graybar Electric Company.

THE DELTABESTON LINE IS COMPLETE

MAGNET WIRE • POWER CABLE • MOTOR LEAD CABLE
ELEVATOR CONTROL CABLE • FIXTURE WIRE
SWITCHBOARD WIRE • CONTROL CABLE • STOVE WIRE

GENERAL ELECTRIC

DELTABESTON WIRE AND CABLE

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

With the MANUFACTURERS

[FROM PAGE 102]

Tork Clock Appointments

John W. Fay has been appointed district sales manager for Tork Clock Company, of Mount Vernon, N. Y., in charge of New England and northern New York. Mr. Fay is also representing Circle F. wiring devices, Collyer Insulated Wire and Gill Glass & Fixture Co.

Harry G. Anschuetz, 117 North Fifth Street, Philadelphia has been made sales manager for Tork Clock Co. in charge of middle and western Pennsylvania, southern New Jersey, Delaware, Maryland, Washington, D. C., and Virginia. He also represented the Triangle Conduit & Cable Co., Abolite Reflector Co. and Circle F. Mfg. Co.

•

Eagle Electric Mfg. Co., Inc. of Brooklyn, N. Y. has moved its Chicago office and warehouse to larger quarters at 627 West Jackson Blvd. It was necessary to make this change due to increased business.

•

Gar Wood Industries, Inc., has recently completed a tiny scaled-down model of an actual residence, which is under construction for its owners. "This model will be used for display and educational purposes" to show home buyers, builders and architects how a modern residence is heated and air conditioned automatically.

•

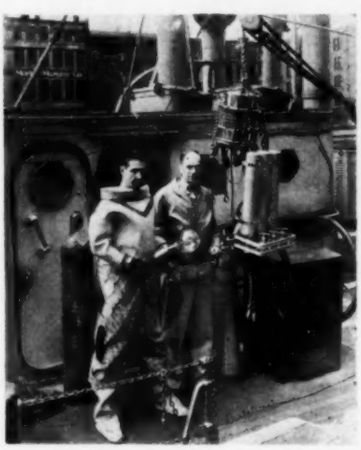
Sales Training

Bernard Lester, industrial executive of the Westinghouse Electric and Manufacturing Co. and lecturer in the University of Pittsburgh, is conducting a training course on marketing technical products. The group is taking the course as part of a University of Pittsburgh-Westinghouse Graduate Study Program. In it are 25 chosen men selected by their department heads, and the results of the training is attracting wide interest. The purpose is to develop men who know the technique of the product to be sold, the character of the market to be met and above all, can interest themselves in his customer's problems and their solution.

•

I. D. Applegate, electrical engineer, will be in charge of engineering, design and development of automatic voltage, current and speed regulators for the Ideal Commutator Dresser Company, Sycamore, Ill. He was formerly with the Westinghouse Electric & Mfg. Co.

•



FLOODLIGHTS FOR DAVY JONES' LOCKER—When Capt. John D. Craig (right), adventurer and deep-sea photographer, descends this summer to the wreck of the Lusitania to film the scheduled salvage operations, his equipment will include a battery of powerful lamps. They were developed by General Electric engineers at Nela Park, Cleveland, laboratories, for deep-sea work. They are rated at 5,000-watts, will stand a pressure of 500 lbs. per sq. in. with an output of 137,500 lumens. The heat is so intense the lamps will fail in a few minutes if burned above water.

•

National Carbon Company, Inc., Carbon Sales Division, has moved its San Francisco district office to new quarters in the Adam Grant Building, 114 Sansome Street. E. C. Friday is district manager.

•

M. E. Clark has been appointed sales manager of Randall Graphite Products Corporation of Chicago. He was formerly with the Bunting Brass and Bronze Company and more recently with Drying Systems.

New Federal No. 30 Horn
With Directional Projector

● For large plants and yards everywhere. Projects sounds in different directions. Volt 0 to 250 a. c. only . . . type 40 for d. c. Built to last a life time.

No. 30 Horn

New Federal No. 30-A
With Grille Front

● Same as No. 30 except for grille. Special steel diaphragm. Ask about New Industrial Bulletin No. 57.

FEDERAL ELECTRIC CO.
8726 So. State Street
Chicago, Illinois

No. 30-A

This book describes

the latest types of motors and controls that are available

and gives you

practical information as to how they may best be applied to the various problems confronting the machine designer.

Just published

Motor and Control Applications

By GEORGE H. HALL

259 pages, 6 x 9, 167 illustrations, $3.00

THIS book deals primarily with the application of motors to machinery, rather than with the design of motors. It tells what each type of motor will do rather than explaining the electrical details by which it is made to do it. This same method is applied to the controls by which the motor is made to perform.

The book is planned to form a complete link between the motor and control, as produced by the motor manufacturer, and the tool or machine as designed by the machine builder.

Some of the material on latest designs of motor and control features has never been available in book form.

10 DAYS' EXAMINATION ON APPROVAL—SEND THIS COUPON
McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. C.

Send me Hall—Motor and Control Applications, for 10 days' examination on approval. In 10 days I will send $3.00 plus few cents postage, or return books postpaid. (We pay postage on orders accompanied by remittance.)

Name .....

Address .....City and State .....

Position .....Company .....EC. 6-37

(Books sent on approval in U. S. and Canada only.)

IT'S PLAYTIME FOR AMERICA . . . AND PROFIT TIME FOR YOU!"

Says **SUNNY LUMENS** *the Goodrich Reflexpert*

"Young and old, they're heading for the playgrounds, the beaches, the courts—and this year, there'll be more places where the fun won't stop when the sun goes down. Get in on this growing popularity of floodlighting."

GOODRICH FLOODLIGHTS

FOR NIGHT SPORTS

How many places in your city would night sports be welcomed? Check them over, look among schools, playgrounds, athletic clubs, country clubs, golf practice courses, beaches . . . contact your school boards, park boards, social groups or private estates.

Goodrich engineers have put floodlighting on a simple, understandable basis. And the Goodrich line includes all sizes and styles of standard floodlights. Here, you can fill every requirement of outdoor sport illumination in the most efficient and economical manner.

THESE FREE LIGHTING PLANS WILL HELP YOU SELL! We have prepared a series of standard lighting layouts for baseball, softball, football, tennis, swimming pools, as well as for many other sports. They're yours for the asking. Let them help you get some floodlighting jobs this year. Write us now.

GOODRICH

ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

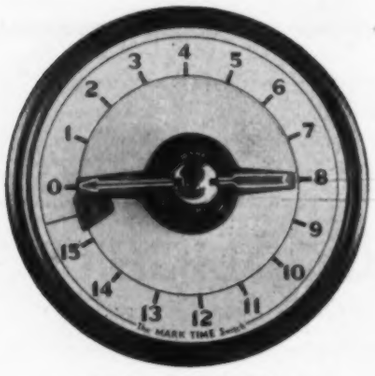
GENERAL OFFICES & FACTORY, 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

Equipment NEWS

CURTIS INDIRECT LIGHTING UNIT

Mark Time Switch

Automatic time switch to be built into any domestic electrical appliance such as a toaster, percolator, washer or cooker or a testing instrument, to provide accurately timed control. Equipped with patented escapement of simple construction, free from frailities of clock movements. Improved clutch mechanism and reduced friction. Stands rough handling. Cannot stop on dead center. M. H. Rhodes, Inc., Rockefeller Center, New York City.

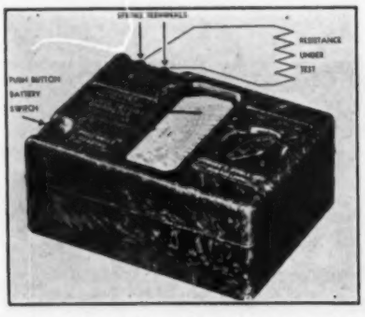


RHODES TIME SWITCH

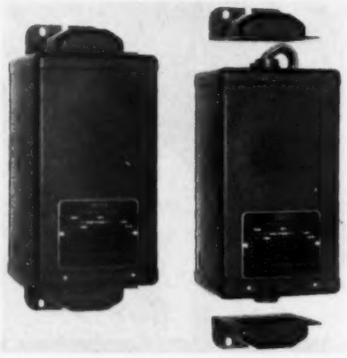
■

Circuit Testing Ohmmeter

Midget "Megger" circuit testing ohmmeter, measures resistance from .1 ohm up to 200,000 ohms, battery operated. Cross-coil type that is independent of voltage of operating battery. Uses standard flashlight battery. For circuit testing, ground testing, motors, etc. James G. Biddle Co., Philadelphia, Pa.



BIDDLE MIDGET "MEGGER" INSTRUMENT



DONGAN UNIVERSAL TRANSFORMER

Mercury Vapor Transformer

Universal mounting type of high intensity mercury vapor lamp transformer. Filled with a special non-melting, highly heat conductive compound, it takes the heat from the enclosed transformer unit and conveys it to the entire surface of the streamlined case. It is claimed that this cooling method results in a much lower operating temperature than if only the laminations were exposed to the outside air. When not used as a wall mounting type, brackets cover the ¾-in. conduit threads. When suspended in conduit line from ceiling to lamp, these dual purpose brackets are removed. Dongan Electric Co., Detroit, Michigan.

■

Paging System

A paging system put up in one package and ready for immediate installation, consists of telephone type microphone, amplifier, two permanent magnet type dynamic speakers and 200 feet of wire. May be expanded to operate twelve speakers if desired. Where alternating current is not available, an electronic converter may be obtained which converts 110 volts d.c. to 110 volts, 60 cycle a.c. Used to locate or summon individuals in offices, factories, laboratories, shops, stores, clubs, hotels, etc., to announce sales or special service in hotels and stores; to broadcast arrivals and departures in airports, depots and at docks; to transmit orders. Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y.

Light-Hood

The "Light-Hood" is designed for industrial indirect lighting. Consists of Lunax aluminum trough, containing light sources, and steel diffusing hood, which breaks up the light and redirects it to working level. Standard sections 10-feet long, use 100, 150, or 200 watt lamps on 30-in. centers in lighting trough. For any work bench, assembly line, inspection table, etc. Curtis Lighting, Inc., Chicago, Ill.

■

FEDERAL ELECTRIC TYPE "D" SIREN

Siren

Type "D" Siren with grease sealed ball bearing motor, ½ h.p. which, it is claimed, adds life to siren and gives greater efficiency. Can be mounted anywhere. Voltage 6 to 250 a.c. or d.c. Dimensions 9½-in. wide, 13-in. long, 15-in. high. Many industrial uses. Federal Electric Co., Chicago, Ill.

■

Magnotecter

An instrument to indicate the polarity of a magnetic field. A positive field causes the needle to deflect to one side, a negative field to opposite side. Negative posts of three dry cells are connected together and to star connection of a three phase induction motor. Other leads are taken from each positive post to each motor lead. The stem of the magnotector is placed in close proximity to the inside of the stator core. A correctly connected winding will show same amount of deflection but in a reverse direction for each

PERMANENT CONDUIT SATISFACTION AT BIGGER CONTRACTING PROFITS!

WHEREVER "CONCRETING-IN" is necessary, J-M Transite Korduct is the logical conduit choice. An asbestos-cement product, like its companion product, Transite Conduit, Korduct offers the same permanent, economical advantages . . . differs only in its lesser wall thickness and lower cost. And Korduct's light weight and long lengths sizably reduce handling charges as well as material costs.

ON EXPOSED LOCATIONS—whether they be indoors or out—Transite Conduit is the economical solution to many conduit problems. This durable material—mineral in composition—is incombustible, weatherproof, unharmed by smoke or corrosive fumes. Throughout the years, it assures continued performance at negligible upkeep.

Johns-Manville
TRANSITE CONDUIT
for use underground without concrete envelope and for exposed locations
TRANSITE KORDUCT
for installation in concrete

UNDERGROUND . . . on telephone, street-lighting, fire-alarm, residential distribution systems, etc., Transite Conduit is strong enough to go down *without* an envelope—hence eliminates concreting costs. Besides these installation savings—its immunity to rot and decay, and high corrosion resistance provide the further economies of virtually maintenance-free service.

WHEN and wherever your customers have conduit problems that must be solved permanently and economically—check the advantages offered by Johns-Manville Transite Conduit and Transite Korduct. By their proper use, you invariably assure permanent conduit satisfaction . . . with bigger contracting profits for you!

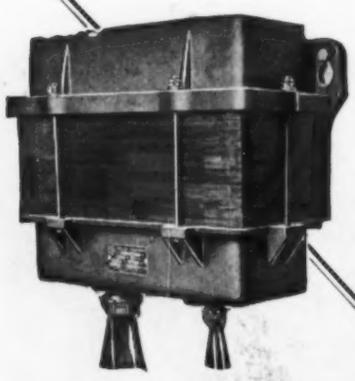
Take that statement "apart" . . . and you'll see just how true it is. Both conduits are asbestos-cement products. Both are resistant to corrosion, incombustible, immune to rot and decay. Hence, practically imperishable and virtually maintenance-free.

On underground jobs, Transite Conduit is strong enough to be laid without a concrete envelope. Meaning immediate, large installation savings. And where conduit has to be "concreted-in," J-M Transite Korduct is the logical choice. Lighter in weight and lower in cost, Korduct sizably reduces handling and material charges on all such installations.

* * *

Of course this isn't the whole story. Full details on the many other advantages of Johns-Manville Transite Conduit and its thin-walled companion, J-M Transite Korduct, are yours for the asking. Write Johns-Manville, 22 E. 40th Street, New York City.

If you use TRANSFORMERS *you will be interested in latest developments by* AMERTRAN



Type CFT three-phase, outdoor-type, air-cooled transformer

Types CF and CFT

- Air-cooled—no oil nor fireproof vault.
- Conduit Fittings—easy to install.
- Single-Phase or Three-Phase types.

AmerTran Air-Cooled Transformers and Auto-Transformers reduce operating costs . . . they may be used on single- or three-phase circuits for supplying 115/230 volts for lighting or power from 230-, 460-, 575-, or 2300-volt power circuits so that advantage may be taken of the lower power rates. Other standard types are furnished for phase-changing, voltage boosting and operating low-voltage equipment. AmerTran is also prepared to furnish many other types of transformers, including types for distribution, power, testing, welding, etc. May we have the opportunity to send information on equipment to meet your requirements?

Type CF single-phase, outdoor-type, air-cooled transformer

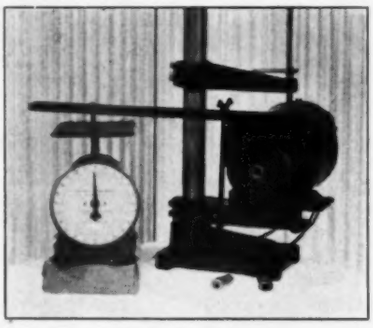
AMER TRAN

American Transformer Company
160 Emmet Street
Newark, N. J.

Equipment NEWS

[FROM PAGE 106]

pole as the Magnotector is moved around inside the stator core. Recommended to check motor connections by the polarity test, to test for shorted coils and to check opens, shorts and reversals in armatures, both a.c. and d.c. Available in horizontal and vertical styles. R. E. S. Swam & Co., Hanover, Pa.



SWAM MAGNOTECTOR

■

EAGLE ELECTRIC TWIN SOCKET

Twin Socket

No screws or nuts are used in the assembly of this bakelite twin socket. Both female outlets have copper spring center contacts. The two copper strips that lead from the female shells are flanged over the bakelite wall and rigid contact is accomplished by spinning the male shell over and below the ends of the copper strips. The male shell is also nicked on opposite sides to ensure permanent assembly. Eagle Electric Mfg. Co., Inc., 59 Hall St., Brooklyn, N. Y.

■

Explosion Proof Fixture

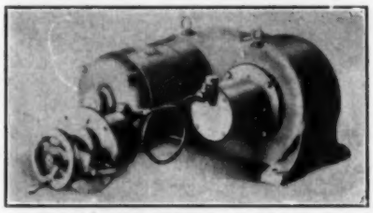
A new line of 200 watt size, enclosing-globe type explosion proof fixtures, with attachable porcelain enamel steel reflectors. Listed by Underwriters' Laboratories for Class I, Group D hazardous locations—atmospheres containing vapors or gasoline, naphtha, petroleum, alcohol, acetone, lacquer solvents and natural gas. Include detachable hood construction, in which socket is held between hood and fixture body by deep-threaded joint to form a barrier between conduit system and lamp chamber. Reflectors provided with dome, shallow dome and symmetrical angle shapes. Fixtures also available without reflectors. Benjamin Electric Manufacturing Co., Des Plaines, Ill.

BENJAMIN EXPLOSION PROOF FIXTURE

■

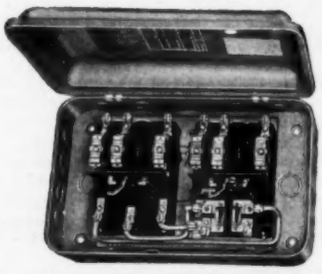
Varidrive Motor

Remote control of variable speed units by hydraulic means. Operator can vary speed of Varidrive unit by turning hand wheel at remote control station. Provides smooth regulation of speed and infinite number of speeds within speed range. A liquid, at remote control station cylinder, is forced through copper tubing to cylinder at variable speed unit itself and movement of cylinder changes speed. U. S. Electrical Motors, Inc., Los Angeles, Calif.



U. S. ELECTRICAL VARIDRIVE UNIT

■

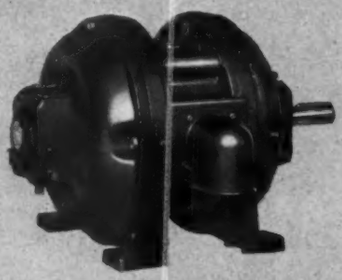


ARROW-HART REVERSING STARTER

Reversing Starters

A line of across-the-line magnetic starters for remote controlled reversing of a.c. motors on hoists, doors, gates, presses and other industrial machines or devices. Made with hand or automatic reset thermal overload protection, and mechanical and electrical interlocks. Thermal heaters provide overload protection in either direction of a motor's rotation, and are interchangeable

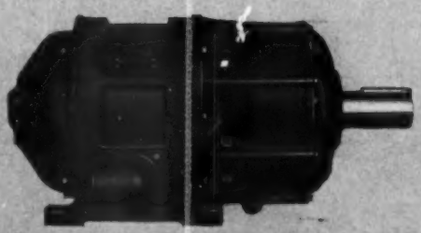
Like adding an hour to the working day



G-E squirrel-cage induction motors mean savings for you and your customers on general purpose jobs

This compact G-E magnetic switch for use with a push-button station gives complete motor protection

G-E manual starting switches give reliable overload protection for a-c motors up to 7½ horsepower



Where you require a quiet, efficient, low-speed drive, use a compact General Electric gear-motor

WHEN you can get nine hours of work done in an eight-hour day, it's like so much money in your pocket. But that's essentially what happens when you use G-E motors and control on your jobs. You actually gain extra time—both you and your installation men—because G-E motors and control are easy to select and apply, easy to install, easy to service.

Look at these features of G-E induction motors that help to make your job easier: roomy conduit box, no-solder terminals, and a connection diagram on every motor to help you make connections quickly; knockoff ledge for easy disassembling; solid feet to make doweling a simple task.

And the G-E controls for these motors save you time, too. Overload relays are already adjusted to the characteristics of the motor. Installation is a simple matter because these switches are easy to mount and convenient to wire. Servicing—when it does become necessary—is readily accomplished.

Next time you're laying out a job, find out how the right combination of G-E motors and control will save you time and money. For complete information, address either the nearest office of the G. E. Supply Corporation, or General Electric Company, Schenectady, N. Y.

020-335

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SOLDERING LUGS—
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Assembled Knob because it "HAS A GRIP LIKE ITS NAMESAKE."

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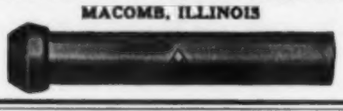
MACOMB, ILLINOIS



Equipment NEWS

[FROM PAGE 108]

in ampere ratings. Two sizes of starters are available. No. 1, rated 25-amp., and No. 2, rated 50-amp. The No. 2 size has maximum rating of 7½ h.p. at 110-volt, 15 h.p. at 220-volt, and 25 h.p. at 440, 550, 600-volts. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

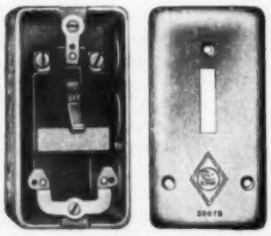
■

SOLAR ELIM-O-STAT

Elim-O-Stat

Type AE Elim-O-Stat developed to overcome the interference in radio receivers caused by electric razors. Capacitive-inductive type contains not only conventional condensers but also induction coils for maximum filtering effect. Installation made by built-in plugs. Finished in black crackle. Solar Manufacturing Corp., 599 Broadway, New York.

■



COLT'S PATENT FIRE ARMS MANUFACTURING CO.

Auxiliary Breaker

The "yoke mounted" Protectit, is a compact control device for mounting in standard metal wall boxes and special metal surface cabinets. Two types available, a fixed capacity device, in ten sizes and an interchangeable heater element type for which there are twenty heater elements of different ratings. Both Protectits have a maximum rating of 250 volts a.c. or d.c. and 1 h.p. Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn.

PORTER-CABLE TAKE-ABOUT SANDER

Portable Sander

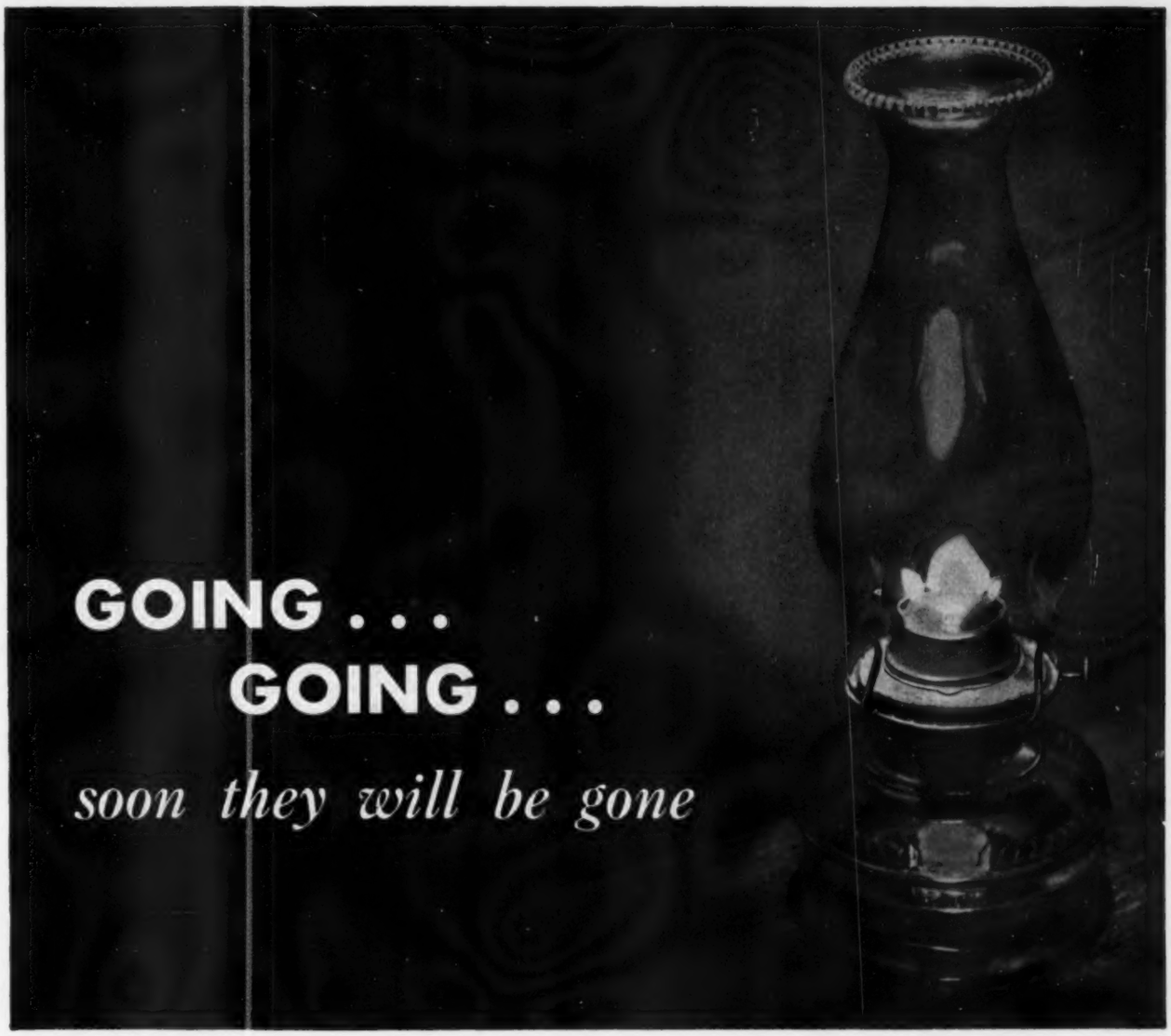
A take-about belt sander for use in industries, schools, cabinet shops, millwork shops, boatyards and many other places, for the elimination of hand labor on both production and maintenance. Uses a 4-in. by 27-in. abrasive belt. Frame is aluminum, with molded bakelite intake and exhaust air grids, rear and front handles non-metallic. Front and rear pulleys 4-in. by 2¾-in. Driving pulley, operated through a silent transmission powered by a 1½ h.p. universal motor. With a belt speed of 1650 r.p.m., it surfaces either new or old wood, removes paint, shellac, varnish or other finish materials down to the grain. Also useful for light metal grinding operations, honing down marble and stone, edging glass and other composition or plastic materials. Porter-Cable Machine Co., Syracuse, N. Y.

■

Square Panel Meters

Square instruments designed for flush or surface panel mounting. Available in d.c. and a.c. milliammeters, ammeters, microammeters and voltmeters, also in dynamometer type wattmeters. D.C. instruments are permanent magnet and moving coil type. System has high overload factor because of rugged, light construction. Magnet is tipped with machined, soft iron pole pieces and core is ground to size and fits in exact center of air gap. Moving vane and also electrodynamometer movements used in a.c. meters. Construction rugged and consumption low. Vanes made from magnetic material of negligible hysteresis loss. Hickok Electrical Instrument Co., Cleveland, Ohio.

HICKOK METERS



ELECTRICITY is going to work for the rural population. The thousands of miles of electrical lines which are now being installed require the use of nearly every type of electrical wire and cable. Engineering problems have made new designs necessary to meet varying conditions.

We have been making electrical wires and cables for many, many years. During that time most of the problems of electrification have been put before our engineers. Our experience and research facilities combined have been successfully called upon in the development of new materials to meet changing requirements.

Look to the American Steel & Wire Company for electrical wires and cables of every description. Our reputation for quality has been built on more than a century of wire-making experience. We welcome the opportunity to be of practical assistance to you in working out your needs for electrical wires and cables, and we are able to supply these needs with products that will give complete service and economy.

American Steel & Wire Company Products for Rural Electrification Projects

Galvanized Steel Conductors · Guy and Messenger Wire · Bare Copper Wire and Strand · Reliance URC Weatherproof Wire · Copperweld-Copper · Service Entrance & Drop Cables · Underground High Voltage Primary Cables · Overhead Concentric Cables · Rubber Covered Wires

ELECTRICAL WIRES AND CABLES

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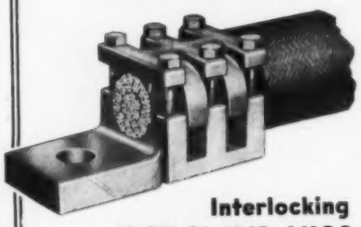
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

Empire State Building, New York

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

K&H
Solderless Terminal
LUGS
and Connectors



Interlocking
VICE-CLAMP LUGS

For No. 3 to No. 2,000,000 C.M. Cable (solid or stranded). Excellent for flexible cable where stranding is "spongy." Single lug takes several different size conductors.

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SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan

SIGNAL

Equipment NEWS

[FROM PAGE 110]

All-Purpose Floodlight

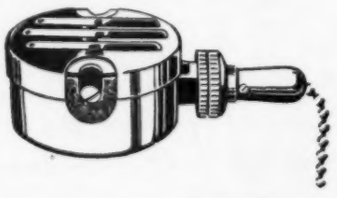
For general utility use in both decorative and commercial lighting. Weather proof and rust proof; 6" convex lens; 60 watt lamp. Heavy gage cadmium plated steel. Red and green color screens for decorative lighting. Electric Distributing Co., 126 North Union Ave., Chicago, Ill.

ELECTRIC DISTRIBUTING FLOODLIGHT

■

Three-light Switch

Levolier fixture switch designed to control the new two-filament, three-light lamps with combined loads as high as 1,000 watts. The switch may be used in canopies, link fixtures, floor and table lamps or outlet boxes, furnished with either pull chain or plain lever control. Rated at 10 amp. 125 volts, 5 amp. 250 volts. Size is 1¾" diameter by ¼". McGill Manufacturing Co., Valparaiso, Ind.



McGILL FIXTURE SWITCH

■

Mercury-Incandescent Units

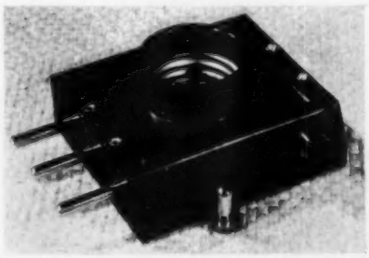
Combination mercury-incandescent lighting unit, 400 watt, for industrial lighting where color correction is desired. Designed for mounting heights of 12 to 18 feet. Spacing should not exceed 1¼ times mounting height. Two circuits are used, one to control mercury lamps and one to control incandescent lamps. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

WESTINGHOUSE COMBINATION LIGHTING UNIT

■

Spell-O-Light Contact

This device controls the sequence and timing of electric lamps for advertising signs, displays and illumination effects. Electrical equipment can be turned on and off. Each contact comprises a molded base with socket, timing knob, switch and connection prongs. First contact unit is connected by an attachment cord to the nearest a.c. or d.c. outlet. Other units are plugged together to form a single group, or by cords for scattered groups. Lamp bulbs of different colors can be turned on in any desired sequence, fast or slow, singly or grouped. Besbee Products Corp., Trenton, N. J.



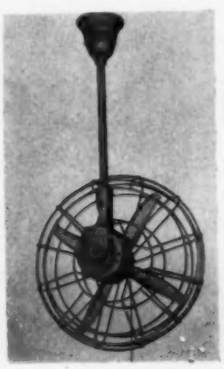
BESBEE SPELL-O-LIGHT CONTACT

■

Air Circulators

Air circulators including wall-mounting, ceiling-mounting, floor and table models designed for use in factories, offices, stores, restaurants, etc. The 22-in. and 28-in. sizes cover all types and sizes of applications. Dark green morroco finish with chromium trim. Propellair, Inc., Springfield, Ohio.

PROPELLAIR CIRCULATOR



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of the electrical and allied products of some

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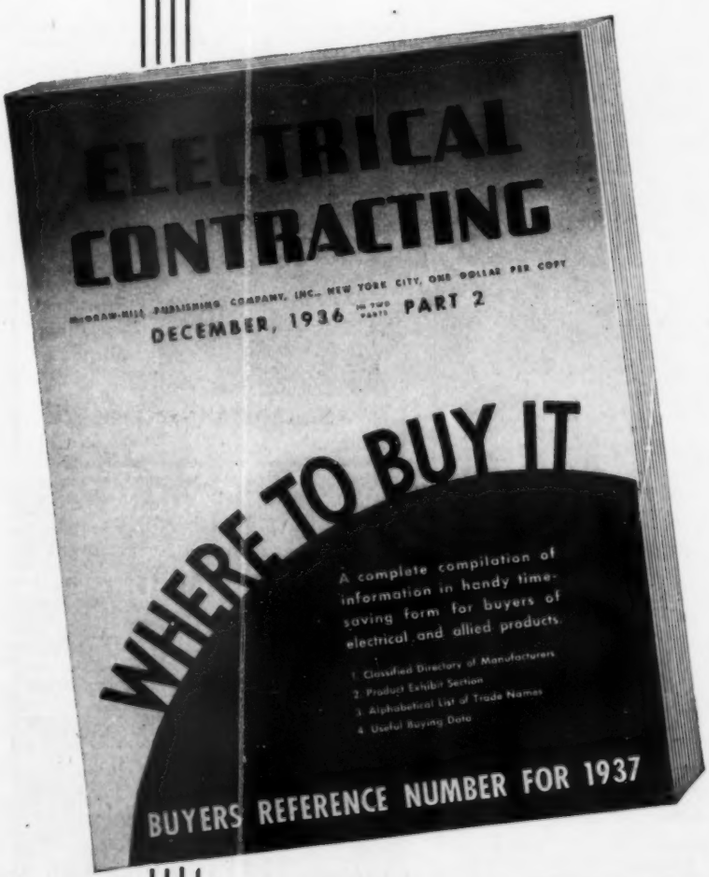
Alphabetically arranged and supplemented, in many cases, by manufacturers' advertisements giving detailed product information.

Keep this book handy—use it in planning your buying—it will save time and money for you!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***The* MARR**
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(CAP MADE OF BAKELITE)

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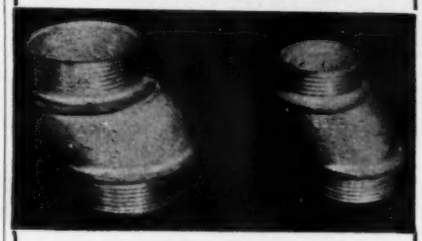
The Hartman Line



An offset nipple* which permits mounting of switches, gutter outlet boxes and other equipment where knockouts don't line up.

*Patent applied for.

WEATHER PROOF SOCKET

Made of aluminum alloy with a high polish finish. Built to hold heavy reflectors at any angle. Neat in appearance — easy to install.

For information see your jobber or write direct.

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Introduces the

MULTI-BREAKER
PANEL BOARD

■ This new development of the Square D Multi-breakeR provides circuit breaker protection and branch circuit switching up to 40 single pole A. C. circuits—and does so at a new low cost. ■ Also built in combinations of single and double pole circuits for 2 or 3-wire lighting distribution systems with branch circuit capacity up to 50 amperes. ■ The Square D Multi-breakeR Panelboard is compact in design and replaces the usual fuse and switch cabinets.

SQUARE D COMPANY
DETROIT - MILWAUKEE - LOS ANGELES
SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

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A Pointer
ON G-E TIME SWITCHES

EASY TO WIRE

The easy wiring features of G-E time switches are causing more and more contractors to use them exclusively on time-control installations. Contractors find that the liberal spacing below the terminal block gives ample wiring room; the five convenient knockouts simplify conduit connections from any direction; and the ingenious riders make time setting quick and simple. These features reduce wiring time and expense and insure maximum profits on each installation. For full information write for your copy of Bulletin GEA-1427F. Address your nearest G. E. sales office, or General Electric, Dept. 6A-201, Schenectady, N. Y.

AND THERE'S NO SERVICING

The extra heavy silver contacts, reliable Telechron motor, moisture-proof case, and sturdy construction, of the General Electric time switches make service calls unnecessary. Your normal profits from the switch and the installation are not reduced by subsequent maintenance. Once a G-E time switch is installed, both you and your customer can forget it. Year after year it will give the same fine service without attention.

Write for a copy of Bulletin GEA-1427F. It contains complete information and prices. Address your request to the nearest G-E distributor or General Electric, Dept. 6A-201, Schenectady, N. Y.

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FEB. 1937

ENGINEERING • INSTALLATION • MAINTENANCE

Plant Surveys Show These Coming Troubles

So next month, a special editorial section on "Instruments."

Usable data and practical advice — for the plant electrician, contractor and service shop — on why and when and how to test.

Check up your test equipment.

OHIO STATE UNIV LIBRARY
COLUMBUS OHIO

THE electrical contractor who has the task of deciding on a type of insulated cable for a power circuit above 2300 volts will want to consider varnished-cloth.

First, because it might be the most economical; secondly, because it can always be depended upon to give long-life service.

Jobs That Call for VC

First, vertical risers in tall buildings and mines. In this case, the cloth tapes are butt-wrapped, and the armor is steel-wire instead of the interlocked shown above. That's what we furnished for the 13,200-volt circuits in the Empire State Building. Next, as "parkway" cable for burying directly in the earth, especially in warm climates. Type VCLJIJ, illustrated, is the one best suited.

VC cable is also ideal for small systems, such as industrial plants. For this service single- and multiple-conductor types are equally popular, with any standard finish —in dry ducts, with a weatherproof or fire-resisting braid; in wet ducts, with lead sheath or rubber-hose jacket.

Extra-flexible types can be furnished for brush-holder leads, and for connections to motors, generators, circuit breakers, transformers, and other apparatus.

Consider the Economies

Now, here's a tip to the contractor who is interested in giving his customers the most for their money.

For some of those same jobs, rubber-insulated cable may fit equally as well. It all depends upon the conditions of the proposed installation—and some times upon the preference of the user.

Where it is a toss-up, however, the choice hinges on economy—which is the cheaper? That in turn depends on the cost of materials at the particular time. It usually pays, then, to investigate—to get quotations on both types—before making the final decision. We shall be glad to help.

Our engineers are unbiased. G.E. can furnish both insulations. In our Versatol, we believe we have the best rubber insulation that can be produced. Likewise, with VC: G.E. was the first to make it—in 1902, when we took out the two basic patents. Since then, we have supplied a large portion of the cloth-insulated cable installed in the United States.

The ONE Best?

But the whole point is this: we desire to supply the one type of cable which from every standpoint—technical and economical—is best adapted for a particular application. To that end, we offer to contractors the services of our cable specialists and engineers. Address the nearest G-E distributor, G-E sales office, or General Electric Company, Dept. 6A-201, Schenectady, N. Y.

520-87

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MARCH 1937

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Use the Genuine
A. B. C. Cable.
Get the Benefit
of the Values
Built in.
Be sure it's
Labeled A. B. C.

AND IT SLIPS IN INSTINCTIVELY

Licensee Manufacturers

ANACONDA WIRE & CABLE CO.
CIRCLE WIRE & CABLE CORP.
COLUMBIA CABLE & ELECTRIC CO.
CRESCENT INSULATED WIRE & CABLE CO.
EASTERN TUBE & TOOL CO., INC.
GENERAL ELECTRIC CO.
NATIONAL ELECTRIC PRODUCTS CORP.
PARANITE WIRE & CABLE CORP.
STANDARD ELECTRIC EQUIPMENT CORP.

The HEART of Every G-E TIME SWITCH Is the World-Famous Telechron Motor

THE heart of a time switch is the all-important unit that marks off the passage of the minutes and supplies the motive power. Like a human heart, it must be sound; it must be tireless; it must be able to take the hardest knocks and yet have a timing perfection of the highest order.

That is why G-E time switches are made with the finest, most accurate motor obtainable — the renowned Telechron electric-clock motor — the motor that can be depended upon to deliver accurate, trouble-free service year after year with never a stop for winding or setting.

And yet this superior timing unit is only one of the reasons why G-E time switches give satisfaction. The positive snap "make" and "break" action, the easy wiring terminals, the 40-amp silver contacts, and the sturdy gear train were all designed to give life-time service, free from repair troubles.

Write for Bulletin GEA-1427 for more complete information on these BETTER switches. General Electric, Schenectady, New York.

Type T-27 time switch for indoor service

440-77

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THE *New* 16-CIRCUIT SQUARE D MULTI-BREAKER LOAD CENTER

—supplements the Square D Multi-breakeR line with a device for use where more than eight circuits are required, giving low cost circuit breaker protection for lighting, appliance and small single phase motor circuits in homes, offices, stores and commercial buildings.

CALL IN A SQUARE D MAN

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

SQUARE D COMPANY CANADA, LTD. TORONTO, ONTARIO

SEND FOR BULLETIN CA-543-A

A Pointer
ON G-E TIME SWITCHES

PLUS PROFITS

For extra profits on wiring jobs with time control, use the time switch with plus values —a G-E time switch. Not only will you obtain a large selling profit on *each* switch, but you get additional profits from low wiring costs, negligible selling expense, and low maintenance. Each wiring job will have an extra profit that means money for you. A copy of Bulletin GEA-1427F shows exactly why G-E time switches are *better switches* to sell. Write for a copy. General Electric Company, Schenectady, N. Y.

AND HERE'S YOUR PROOF

EASY WIRING: liberal spacing below the terminals, five convenient knock-outs for conduit connection, connecting lugs, easy time setting, simple mounting. These features reduce your wiring time and costs.

EASY SALES: your prospect knows that he can depend on a G-E time switch. The well-known Telechron motor and extra-heavy silver contacts assure him of years of trouble-free service.

LOW MAINTENANCE: there are no maintenance calls to cut into your profits. Once a G-E time switch is wired, you and your customers can forget it.

Use a G-E time switch on your next sign or store-window lighting installation. For further information, see your nearest G-E distributor, General Electric Supply Corporation, or write to General Electric, Schenectady, N.Y.

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RISING PRICES!

Every contractor's customers face rising prices too. They want to cut *their* costs. And that brings him his opportunity.

DO THIS! — Visit your industrial and commercial customers. Look around and spot the places where better equipment, better control or better light will bring economies. Sell the idea. Get the order.

And to make it pay — *use the right tools.* What tools? Study the coming Editorial Feature Section — "TOOLS ON THE JOB" — next month.

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A Pointer
ON G-E TIME SWITCHES

EASY TO WIRE

The easy wiring features of G-E time switches are causing more and more contractors to use them exclusively on time-control installations. Contractors find that the liberal spacing below the terminal block gives ample wiring room; the five convenient knockouts simplify conduit connections from any direction; and the ingenious riders make time setting quick and simple. These features reduce wiring time and expense. For full information write for your copy of Bulletin GEA-1427F. Address your nearest G. E. sales office, or General Electric, Dept. 6B-201, Schenectady, N. Y.

AND THERE'S NO SERVICING

The extra-heavy silver contacts, reliable Telechron motor, moisture-proof case, and sturdy construction, of the General Electric time switches make service calls unnecessary. There will be no expensive maintenance costs to cut into plant profit. Once a G-E time switch is installed, both you and your customer can forget it. Year after year it will give the same fine service without attention.

Write for a copy of Bulletin GEA-1427F. It contains complete information and prices. Address your request to the nearest G-E distributor or General Electric, Dept. 6B-201, Schenectady, N. Y.

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Packed Fresh— Kept Fresh

WRAPPED AND SEALED IN CELLOPHANE

SOLD ONLY THROUGH RECOGNIZED JOBBERS

RUBBER DIVISION *Jenkins Bros* BRIDGEPORT, CONNECTICUT

FLOODLIGHTS OF THE MONTH

The Handy Floodlights

Junior, 100-watt, AL-35
Senior, 200-watt, AL-36

No. 4 of a series to acquaint you with G-E floodlights—to help you increase profits

IT'S HANDY TO USE

For garden, yard, playground, and utility lighting around the home or farm.

For general small-area floodlighting anywhere.

For temporary or permanent installations, or as a portable unit.

IT'S STURDY AND LONG LIVED

Reflector—Spun aluminum with aluminum-oxide (etched) surface is standard. Also available with polished or etched Alzak aluminum for greater permanence.

Support and Cover—Die-formed steel support and aluminum socket cover are pressed on the reflector.

Socket—Medium-screw, porcelain base, fixed focus for General Service incandescent lamps.

Mounting—Units equipped with large circular steel base, and stand as illustrated. Four feet of insulated cable included with each unit.

Door—Plain convex glass mounted in a split aluminum retaining ring.

Finish—Dark-green, baked-on enamel, except retaining ring which is natural aluminum finish.

IT'S EFFICIENT AND ADAPTABLE

Lamp	Reflector	Beam Angle	Factor F	Beam Lumens	
				Junior 100-watt	Senior 200-watt
Clear	Polished Alzak	35°	0.63	—	1280
Inside frosted		55°	1.04	370	1325
Clear or inside frosted	Standard surface or etched Alzak	110°	2.86	785	1690

Factor F times the distance from floodlight to surface lighted gives approximate beam diameter.

IT'S INEXPENSIVE

Junior Handy, 100-watt, as illustrated..... $6.50
Senior Handy, 200-watt, as illustrated..... $10.50

Steel spike for temporary ground installation included.

For etched Alzak aluminum reflector surface, add (Junior) $1.50, and (Senior) $2.00.

For polished Alzak aluminum reflector surface, add (Junior) $3.00, and (Senior) $4.00.

All prices list, including freight charges.

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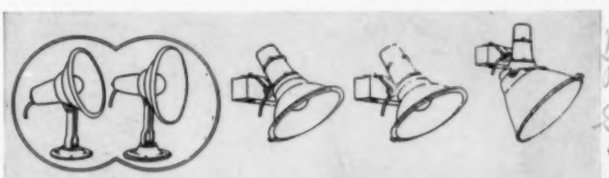

Type AL-35 100-watt | Type AL-36 200-watt | Type AL-49 300/500 watt | Type AL-43 750/1000 watt | Type AL-48 1500-watt

500-232

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